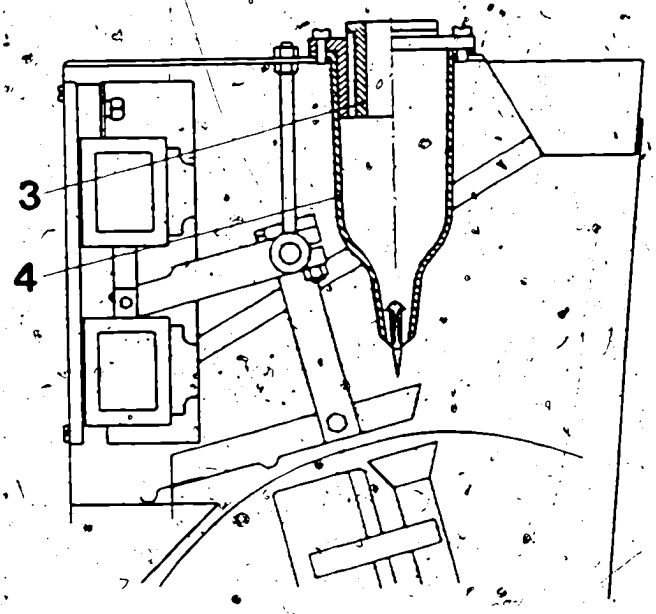
40...46; 58

MOUNTING PLATFORM FOR
CALIBRATING NOZZLE-HOLDER ASSEMBLY
KDEP 1140

VDT-I-460/1004 En
4.1985



While testing with KDEP 1140 on test benches of series EFEP 375...410 and 5.., i.e. on green and blue test benches, it may happen that calibrating oil escapes through the sight glass (Item 4).

Remedy

Use of reduction sleeves of the latest type (Item 3), with longitudinal grooves on the inside.

Part No. 1 680 323 003.

1 Technical Bulletin

A1

Published by:

Robert Bosch GmbH
Division KH
Technical After-Sales Service (KH/VKD 2)

Please direct questions and comments concerning the contents to our authorized representative in your country.

EXPLANATORY NOTES ON DEFECT NUMBER LIST FOR DISTRIBUTOR-TYPE FUEL-INJECTION PUMPS

VDT-I-460/126 En
5.1982

Complete and correct warranty reports are essential for the quick handling of warranty cases and are the basis for statistical quality control.

For pertinent reasons we should like to make the following explanatory remarks on the defect number list for distributor-type fuel-injection pumps, VDT-WAA 050/9-15, of the warranty manual:

1. Defect-numbers

Injection pumps coming to the BOSCH after-sales-service workshops are in principle field goods, i.e. not 0-km items (warranty category 0).

Complaints on field goods should be reported exclusively with the defect numbers printed "straight" and not with those printed in italics (slanting).

2. Defect number 00

The defect number 00 was introduced for the statistical recording and accounting of defects which it was possible to remedy through minor corrections to the distributor-type fuel-injection pump.

Important note:

The checking of an injection pump is governed in general by the checking tolerances in the test-specification sheet (values in brackets). If the actual values are within the checking tolerance and the injection pump does not have any other defects, the warranty claim must be rejected.

For the correct assessment of an injection pump it is necessary that all checking points be measured. If there are several defects, only that defect causing the complaint should be reported.

In the following we describe when to use the defect number 00 when assessing the defects of a distributor-type pump on the injection-pump test bench.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

A3

The defect number 00 should be reported when the actual value is within a checking tolerance (value in brackets) which has been additionally extended by 50 %.

In this case it is not necessary to make a claim in plain text.

Examples of extended checking tolerances:

Full-load delivery:

Checking value (value in brackets)	=	22.3 - 26.7 cm^3/1000 lifts
Checking tolerance	=	4.4 cm^3/1000 lifts
Tolerance extended by 50 % (4.4 x 1.5)	=	6.6 cm^3/1000 lifts
yields an extended checking value	=	21.2 - 27.8 cm^3/1000 lifts

Timing-device travel:

Checking value (value in brackets)	=	2.95 - 4.35 mm
Checking tolerance	=	1.4 mm
Tolerance extended by 50 % (1.4 x 1.5)	=	2.1 mm
yields an extended checking value	=	2.6 - 4.7 mm

If an actual value is outside the extended checking values, look for the cause of the trouble. If no component defect is found, report defect no. 10 in the case of fuel deliveries, and defect nos. 72 and 73 in the case of timing-device travel as well as the actual value in plain text.

Incorrectly set idle deliveries (low idle) must be critically assessed since the idle-adjusting screw is not lead-sealed at the factory. Incorrectly set idle deliveries must only be reported if the lead seal fitted by the vehicle manufacturer is undamaged.

Please direct questions and comments concerning the contents to our authorized representative in your country.

A4

BOSCH

Defect number list
0 46_

0 46_ Distributor-type Fuel-injection Pumps

Troubles with the product as a whole

00 Pump not defective, including slight adjustments
01 Operational trouble, fault not located (make claim in plain text)
02 Damage in transit (make claim in plain text)
11* *Full load delivery wrong (lead seal not damaged)*
12* *Idle load wrong (lead seal not damaged)*
13* *Speed regulation wrong (lead seal not damaged)*
14 Change from excess-fuel delivery to full-load not correct
15 Excess-fuel delivery insufficient
16 Foreign matter in pump
17* *Overall delivered-quantity scatter is excessive*
18* *Wrong parts (make claim in plain text)*
19* *Wrong nameplate*
10 Fault located, no special defect number (make claim in plain text)

Hydraulic head troubles

21 Main plunger seized in hydraulic head
22 Main plunger seized in regulating collar (VE only)
23 Delivery valve leaky or sticking
24 Ball valve leaky (VA only)
25 Regulator collar sticking
26 Delivery valve holder leaky
27 Central screw plug leaky
28 Automatic excess-fuel device defective (VA only)
29* *Plunger lift to port closing wrong*
20 Fault located, no special defect number (make claim in plain text)

Pump housing troubles

31* *Missing parts (make claim in plain text)*
32* *Control lever travel wrong (-)*
33 Plain bearing worn out, tilting play of drive shaft too large
34* *Port closing setting wrong*
35 Control lever bearing leaky
36* *Lead sealing on governor cover is damaged*
37 Pump housing leaky
38* *Radial-lip-type oil seal leaks*
39* *Slotted shoulder screw leaks*
30 Fault located, no special defect number (make claim in plain text)

0 46_ (Continued)

Mechanical governor troubles (VE only)

41 Sliding sleeve sticking
42 Dimension "MS" incorrect
43 Starting lever sticking
44 Flyweights sticking
45 Ball pins loose
46 Shut-off shaft leaky
47 Governor shaft leaky
48* *Stop lever difficult to move*
49 Load-dependent start of pump delivery incorrect
40 Fault located, no special defect number (make claim in plain text)

General leaks

51 Timing advance cover leaky
52 Adjusting hole leaky
53 Governor cover leaky (VE only)
54 Pressure-regulating valve leaky
55 O-ring at hydraulic head defective (leaky)
56 Bleeder screw leaky
50 Fault located, no special defect number (make claim in plain text)

Drive troubles

61 Plunger return spring broken
62 Driving pin in cam plate loose
63 Rubber buffer worn
64 Cam roller ring sticking
65 Drive shaft seized
68 Rollers and cams seized
60 Fault located, no special defect number (make claim in plain text)

Timing device troubles

72 Timing-device travel too large
73 Timing-device travel too small
74 Timing-device piston sticking
75* *Wrong timing-device spring*
76* *Wrong timing-device piston*
70 Fault located, no special defect number (make claim in plain text)

81 Overflow valve sticking (VA only)
82 Pressure regulating valve sticking
83* *Wrong supply-pump pressure*
84 Vane sticking in supply pumpe
85 Supply pump seized
86* *Wrong overflow quantity*
80 Fault located, no special defect number (make claim in plain text)

Auxiliary device troubles

91 Manifold-pressure compensator/altitude-pressure compensator defective or leaky
92 Electric shutoff (ELAB) defective or leaky
94 Cold-start accelerator defective or leaky (VE only)
95 Temperature-dependent start quantity incorrect
96 Idle increase incorrect
90 Fault located, no special defect number (make claim in plain text)

* Only use the numbers in *italics* for warranty cases on 0 km items (warranty types 5, 6 or 8)

A5

FAILURE OF THE FUEL-INJECTION SYSTEM DUE TO WATER IN THE FUEL

VDT-I-460/133 En
10.1983

Information sent us from the After-Sales Service Organisation on the failure of distributor-type fuel-injection pumps because of rust, has led us to point out the following:

Rust damage to distributor-type fuel-injection pumps is not a material or manufacturing fault which is covered within the framework of our guarantee conditions. Failures of this kind are due entirely to an inadmissibly high water content in the fuel system, upon which we, as manufacturers of diesel fuel-injection equipment, have no influence.

Failure of the fuel-injection system due to water damage can be avoided by draining off the water befor it is too late. We therefore recommend fitting a water-level indicator for diesel box-type filters (part no. 1 457 001 001), which by means of a control lamp informs the driver in good time that he should drain off the water that has gathered in the system (See also KH Information of 9.11.1982).

If there is a very high water content in the fuel, we recommend water separator 0 450 198 008 (design with flat flange on the cover, specially for VAG vehicles) which can be used for all diesel engines, as well as water separator 0 450 198 009 (design with angled flange on the cover and with connecting parts). Further details can be found in the KH Information Bulletins of 7.8.1980 and 7.11.1980.

BOSCH
Geschäftsbereich KH Kundendienst, Kfz-Ausrüstung

Kundendienst KH

Technische Mitteilung

Hanomag vehicles with EP/VA.. distributor-type injection pump
Trouble-shooting notes

VDT-BMP 161/24 B
Edition 11.70
edition of 22.9.70

To our foreign representatives

This Technical Information Sheet gives some trouble-shooting notes for Hanomag vehicles with EP/AV.. distributor-type injection pumps. Only possible faults connected with the injection system are mentioned. Faults in the electrical system or in the engine are assumed to be known and are therefore not taken into account here.

Symptom		Fault	Remedy
I. Engine will not start	1.	Lack of fuel	
	1.1	Tank empty	Fill with fuel
	1.2	Air in the fuel circuit	Vent in accordance with BMP 161/19 dated 19.10.1967 point 7
	1.3	Priming pump (not of Bosch manufacture) defective	
	1.3.1	Strainer clogged	Clean strainer screw.
	1.3.2	Suction valve broken	Replace upper section of pump
	1.3.3	Delivery valve worn	Replace upper section of pump
	1.4	Fuel filter clogged	Replace filter box; where fitted, clean primary filter Note: Use only original filter boxes (see also BMP 161/18 dated 19.12.1969)
	1.5	Lines blocked	Clean lines, remove constrictions
	1.6	Paraffin wax deposits at temperatures below freezing point resulting from unsuitable fuel	Proceed in accordance with BMP 161/23 dated 18.9.1968
	1.7	Distributor-type pump (DP) defective	
	1.7.1	Drive and supply pump are binding	Repair DP or replace entire DP
	1.7.2	Pump plungers are binding	Repair DP by replacing the distributor head or replace entire DP

BOSCH
Geschäftsbereich KH Kundendienst Kfz Ausrüstung
by Robert Bosch GmbH D-7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

Symptom	Fault	Remedy
	1.7.3 No starting quantity	Check DP. Free starting
	1.7.3.1 Pumps with automatic starting quantity: Starting piston in the distributor head is sticking or helical spring is broken	piston or replace helical spring (see also BMP 161/26 dated 11.12.1968)
	Pump plungers are worn	Repair DP by replacing the distributor head or replace the entire DP
	1.7.3.2 Pumps with mechanical starting quantity: Pump plungers are worn	Repair DP by replacing the distributor head or replace entire DP
	2. Incorrect injection point	
	2.1 Basic port-closure setting incorrect	Adjust to prescribed value (BMP 161/19 dated 19.10.1967)
	2.2 Timing device is sticking	Repair DP
II. Low idle irregular, speed too high, cannot be adjusted	Check valve in distributor head leaks (caused by dirt on the seat).	Try to dislodge dirt from seat by repeatedly accelerating jerkily at a standstill. If this gives no improvement, repair DP see BMP 161/31 B and 1st. 1st. supplement
III. Engine hunts during idling	1. Overflow valve on DP is sticking	Replace overflow valve
	2. Supply pump pressure too low (timing device or pressure equalizer piston worn)	Check DP; adjuste supply pump pressure to prescribed value or replace DP if worn
IV. Engine has no power	1. Lack of fuel	
	1.1 Fault in circuit	see under I
	1.2 Full-load quantity of DP too small	Check DP and adjust full-load quantity to prescribed value
	2. Port-closure adjustment ring incorrectly set (too far retarded)	Adust port-closure to prescribed value (see BMP 161/19 dated 19.10.1967)
	3. Timing device is sticking in retard position	Repair DP
	4. Injection nozzles defective	Check nozzles, correct opening pressure, replace damaged nozzles

Symptom	Fault	Remedy
V. Engine emits very black smoke in full-load range	Full-load quantity of DP too great	Check DP and adjust full-load quantity to prescribed value
VI. Engine has no power and emits very black smoke	1. Incorrect pump setting	
	1.1 Port-closure adjustment ring incorrectly set (too far retarded)	Adjust port-closure to prescribed value (see BMP 161/19 dated 19.10.1967)
	1.2 Delivery quantity settings of the DP incorrect (too high)	Check DP and adjust the delivery quantities to the prescribed values
	2. Timing device is sticking in retard position	Repair DP
	3. Injection valves defective	Check nozzles, correct opening pressure, replace damaged nozzles
VII. Engine afterfires	Stop position of the spill piston (delivery rate control lever) is set too early	Correct setting
VIII. Engine runs hard, emits very black smoke in the full-load range, possibly with loss of power	1. Port-closure setting too advanced	Adjust port-closure to prescribed value (see BMP 161/19 dated 19.10.1967)
	2. Timing device is sticking in advance position	Repair DP
	3. Injection nozzles defective	Check nozzles, correct opening pressure, replace damaged nozzles
IX. DP leaks	1. Pipe connections leak	Check pipe connections for cavitation. Fit new gaskets and/or pipe connections
	2. O-ring seal is damaged	Fit new O-rings

Kundendienst KH

Technische Mitteilung

EP/VA ..
Defects in the ball check-valve in the distributor head

VDT - BMP 161/ 31 B
Edition 2.70
Translation of German edition of 8.4.1969

To VH, AV/S, BD, BV

Our technical information sheet BMP 161/24 dated 18.12.68 gives trouble-shooting instructions for Hanomag vehicles fitted with EP/VA.. injection pumps. Naturally, these instructions can always be used for other makes of tractors fitted with EP/VA . injection pumps.

It has been found that the following defect often occurs:

Point II - Lower idle irregular, speed too high, not adjustable

The cause is bad sealing of the check valve in the distributor head. This valve is a ball check-valve which may seal badly due to dirt on the valve seat.

If a vehicle or tractor is brought into you workshop with the above fault, first check, as mentioned in technical information sheet BMP 161/24, whether the dirt can be removed from the valve seat by sudden acceleration of the engine.

If this is not successful, the injection pump must be removed.

If the cause is dirt on the ball or on the valve seat, which has not damaged the seat, one can proceed as follows.

1. Dismantle distributor head without removing the delivery valve connections and delivery valves.
2. Provisional testing for check valve leaks
   Insert the compressed air pistol in the spilt piston port and apply pressure. If air comes out of the auxiliary circuit port of the ball check-valve, the valve is leaking.
3. Elimination of the leak
   Lift the ball with a suitable hook and blow out the dirt from the ball valve.
4. Refitting the distributor head and checking according to test sheet
   If the prescribed test values are not obtained, particularly in the idle range, the valve seat must be reground.

A supplement to this technical information sheet, dealing with this repair work, is being prepared, copies will be sent to you as soon as they become available.

In this connection we ask you to keep good contact with your repair shop so that faults may be immediately recognised and eliminated.

The decision whether you should carry out this repair depends largely on how long the tractor or the injection pump was in operation with this defect and whether the valve seat has not yet been damaged.

KH/VKG 2

BOSCH
Geschäftsbereich KH Kundendienst Kfz Ausrüstung
by Robert Bosch GmbH D 7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

A10

0 460 .. - EP/VA ..H..C..
Distributor-type fuel-injection pump with quiet-idle device

VDT-I-460/100 B
4.1976

Quiet-idle device leakage test

The quiet-idle device leakage test can be carried out either in the vehicle or on the test bench.

1. Leakage test in the vehicle

1.1 The linkage between the quiet-idle device and the operating lever must be disconnected.
Note: The quiet-idle device lever must not be removed.

1.2 Remove the hose from the quiet-idle device.

1.3 Push a transparent hose onto the quiet-idle device fitting for the purpose of measuring the leakage fuel.

1.4 Position the quiet-idle device lever exactly vertically, pointing upwards towards the return fitting (see fig. 1). The quiet-idle device has thus been put out of action.

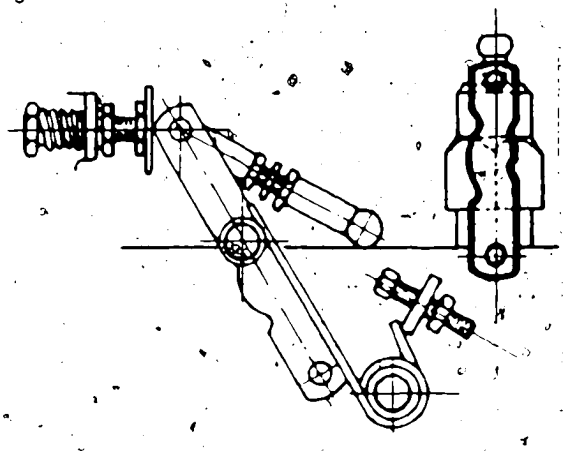
1.5 Set the engine to idle speed.

1.6 Measure the overflow quantity with a suitable measuring glass. In so doing ensure that the fuel flows uniformly out of the hose during the measurement.

1.7 Test value:
Permissible leakage quantity = max. 6 cm^3 during measurement time of 3 mins.

1.8 If the permitted value is exceeded, the quiet-idle device must be replaced.
Tightening torque for central screw plug: 40 - 60 N.m (4 - 6 kgf.m).

1.9 The linkage should be set in accordance with VDT-BMP 161/36 B.



BOSCH
Geschäftsbereich KH Kundendienst Kfz-Ausrüstung
© by Robert Bosch GmbH D-7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

A11

BOSCH

REPAIR INSTRUCTIONS
INSTRUCTIONS DE REPARATION
INSTRUCCIONES DE REPARACION

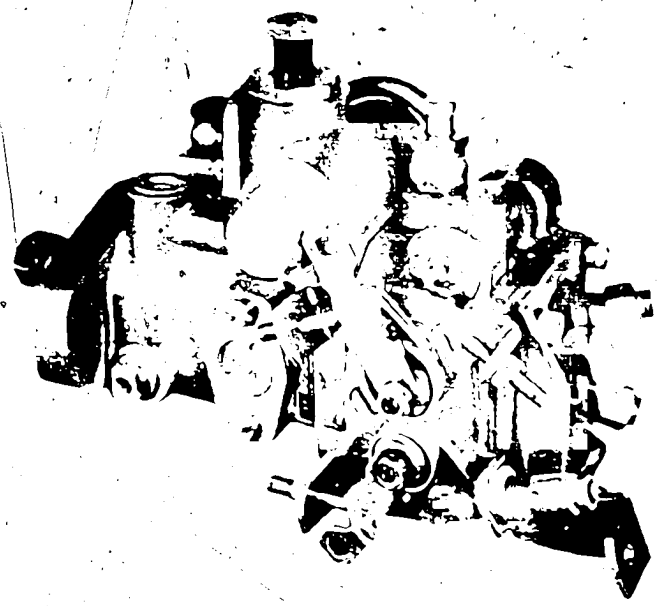
VDT-WJP 161/3 B

EP

Edition 2.68

Distributor-type Fuel Injection Pump
Pompe distributrice
Bomba distribuidora de inyección

EP/VA..H..A.. 0 460..



Printed in Germany - Imprimé en Allemagne 860 F60
par/von Georg Knobloch, Stuttgart

A12

TABLE OF CONTENTS

1. Tools.....
2. Disassembly.....
3. Components inspection.....
4. Assembly.....
5. Auxiliary tools.....
6. Tightening torques.....

SOMMAIRE

1. Outillage.....
2. Démontage.....
3. Vérification des pièces.....
4. Remontage.....
5. Outillage auxiliaire.....
6. Couples de serrage.....

INDICE

1. Herramientas.....
2. Desmontaje.....
3. Comprobación de las piezas.....
4. Montaje.....
5. Herramientas auxiliares.....
6. Pares de apriete.....

1 TOOLS OUTILLAGE HERRAMIENTAS

Tool Outil Herramienta	Part No. Référence No. de pedido	Type designation Symbole Fórmula de tipo	Use Utilisation pour Aplicación
Swivel vise Support de fixation Soporte de sujeción	0 681 240 048 +	EF 8498	For clamping pump Fixation de la pompe Sujeción de la bomba
Clamping bracket Support Soporte	1 688 120 034 +	EFEP 432	For clamping pump Fixation de la pompe Sujeción de la bomba
Extractor hook Crochet d'extraction Gancho de extracción	1 687 959 010	EFEP 467	For removing seals Enlèvement des joints Quitar los anillos de junto
Seal protecting sleeve Douille de montage Manguito de montaje	1 680 300 040 +	EFEP 442	For protecting oil seal Protection de l'anneau d'étanchéité Protección del anillo de retención
Stop plate Plaque de butée Placa de tope	1 680 022 002	EFEP 502	For setting travel of timing piston Réglage de la course du piston de l'avance à l'injection Ajuste de la carrera del émbolo del variador de avance
Gauge ring Bague de mesure Anillo de medición	1 683 458 007	EFSR 3Y 13X	For setting timing piston travel and compressed spring length adjustment Réglage de la course du piston de l'avance automatique et de la longueur de montage du ressort Ajuste de la carrera del émbolo del variador de avance y del largo de montaje del resorte
Measuring device Dispositif de mesure Dispositivo de medición	1 688 130 045	EFEP 462	For plunger lift to port closure adjustment Réglage de la précourse Ajuste de la carrera improductiva
Measuring device (two parts) Dispositif de mesure (en deux parties) Dispositivo de medición (en dos piezas)	1 688 130 047	EFEP 466	For determining governor springs Evaluation du ressort de régulation Determinar el resorte de regulación
Assembling sleeve Douille de montage Manguito de montaje	1 680 390 008	EFEP 461	For protecting the O-ring Protection du joint torique Protección del anillo O
Spacer bushing Douille calibre de distance Casquillo de distancia	1 680 300 039	EFMB 21 Y 5 X	For setting piston spring preload Réglage de la tension initiale du ressort de piston Ajuste de la tensión previo del resorte del émbolo

*) Already in use for EP/VM...
Est déjà utilisé pour EP/VM...
Se emplea ya con EP/VM...

Complete set of above tools: 1 687 000 012 (swivel vise 0 681 240 048 not included) Jeu complet de l'outillage ci-dessus: (sans support de fixation 0 681 240 048) Juego completo de las herramientas anteriores: (sin el soporte de sujeción 0 681 240 048)		EFEP 522
Tool set supplementing EP/VM... tools Jeu d'outillage complémentaire à l'outillage des pompes EP/VM Juego complementario de las herramientas de EP/VM...	1 687 000 014	EFEP 524

2 Disassembly

Remove coupling. Mount injection pump in swivel vise 0 681 240 048 using clamping bracket 1 688 120 034. Remove hex nuts with spring washers, speed control lever, stop lever, washer under stop lever and torsion springs.

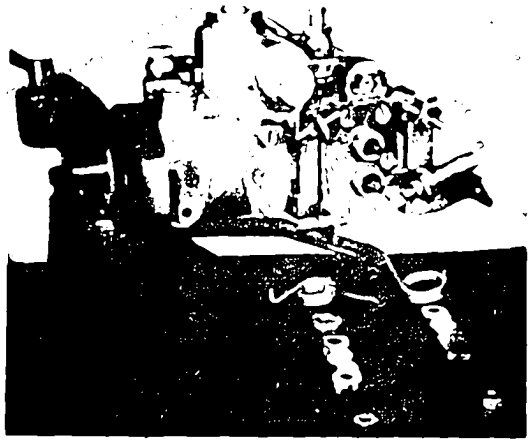


Fig. 1

Unscrew flat-head screws and remove stop plate.
Remove spill piston governing assembly with governor spring.
Withdraw spill piston.

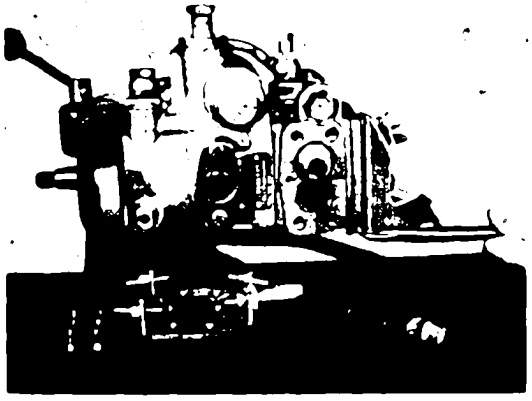


Fig. 2

Take apart spill piston governing assembly. For this purpose, place threaded end onto work bench and push out bushing downwards. Remove O-rings from shaft and bushing.

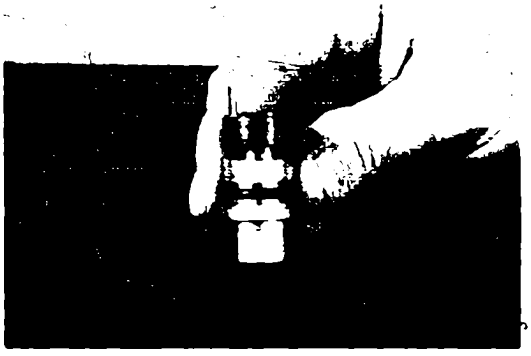


Fig. 3

Remove throttle with helical spring and cross-type disc.
Attention:
Do not drop or lose spacer. This spacer is matched in production to the distributor head and cannot be replaced.

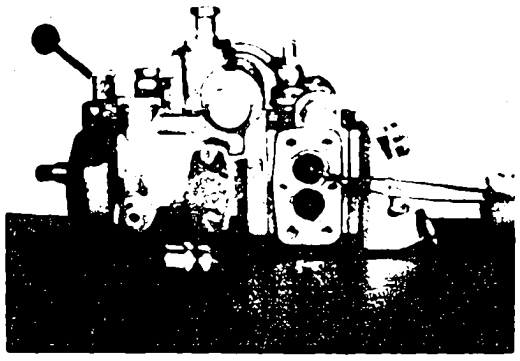


Fig. 4

Disassemble throttle bushing assembly by placing threaded end on work bench and pressing out bushing downwards. Remove O-rings from shaft and bushing.

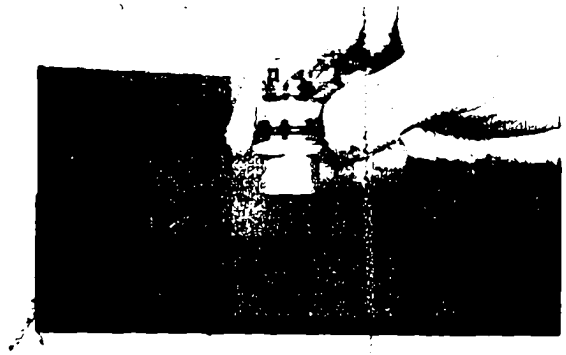


Fig. 5

Remove delivery valve holders, delivery valves, springs, shims and space fillers, if any. Remove gaskets under delivery valves with extractor hook 1 687 959 010. Unscrew center screw plug with gasket from distributor head.

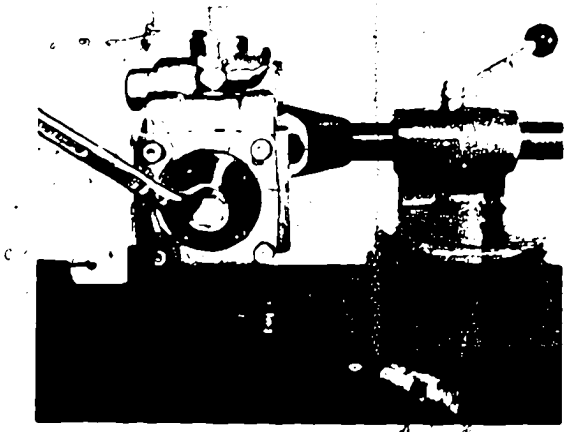


Fig. 6

Unscrew pressure equalizer end plugs. Take off O-rings. Push out helical spring and equalizer piston.

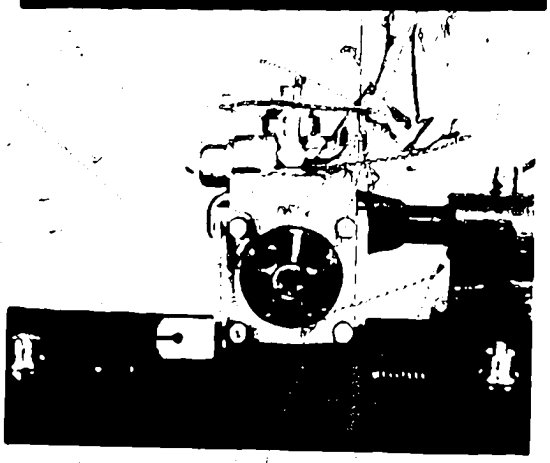


Fig. 7

Remove bleeder screw and gaskets from intermediate housing and the inlet union screw with strainer and gaskets together with fuel line from pump housing. Unscrew the four hex. socket head screws and spring washers from intermediate housing and remove support bracket, if any, and flange.

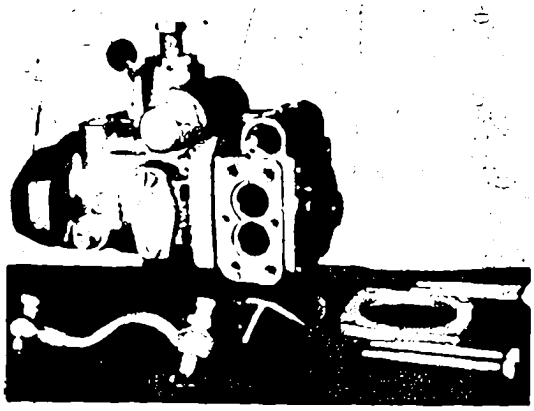
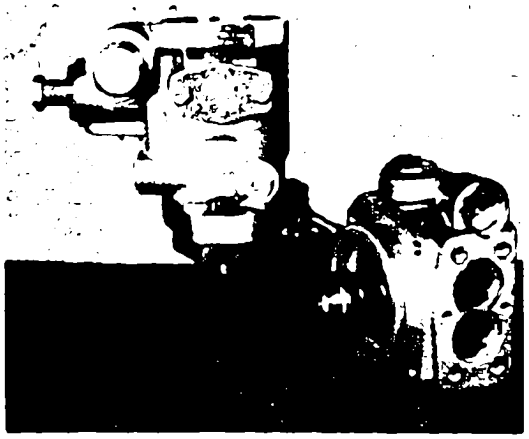
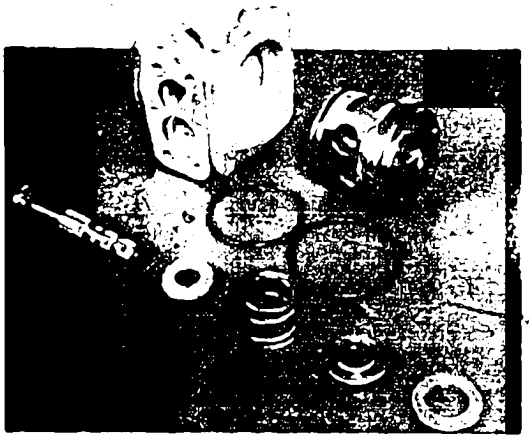


Fig. 8



Withdraw intermediate housing from pump housing with a slight twisting movement.
Remove 0-ring from intermediate housing pilot side and remove the shims.

Fig. 9

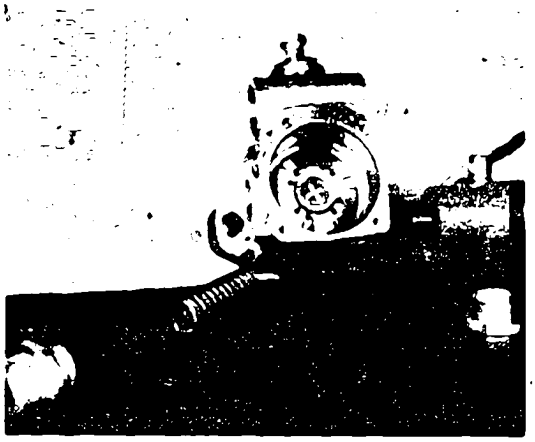


Remove distributor plunger, upper spring seat, return spring, lower spring seat and bearing.
Push distributor head out of intermediate housing and remove the two 0-rings.

Fig. 10

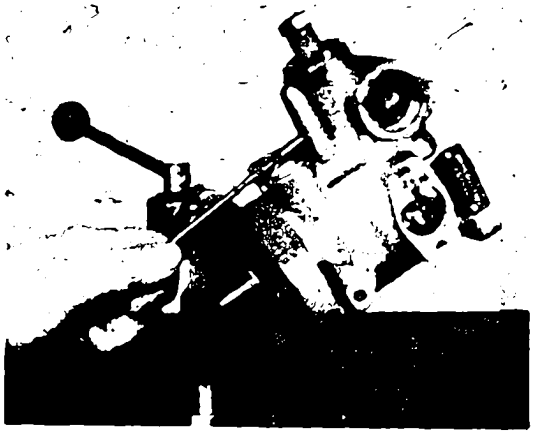
Unscrew the fillister-head screws withdraw cover and remove 0-ring.
Unscrew fillister-head screw with washer and detach the timing pointer.

Fig. 11



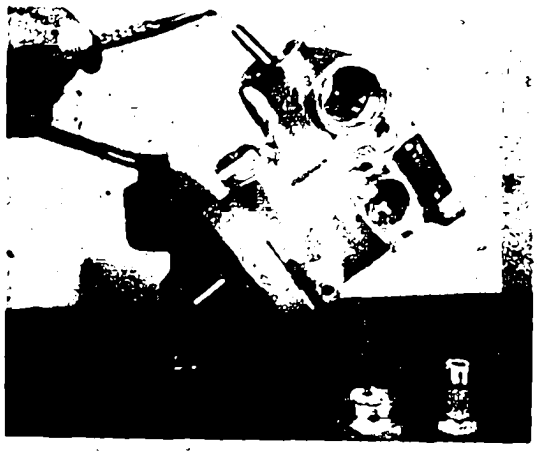
Remove automatic timing piston end cap and end plug.
Remove 0-rings.
Note shims in end cap on spring side.
Remove the spring.

Fig. 12



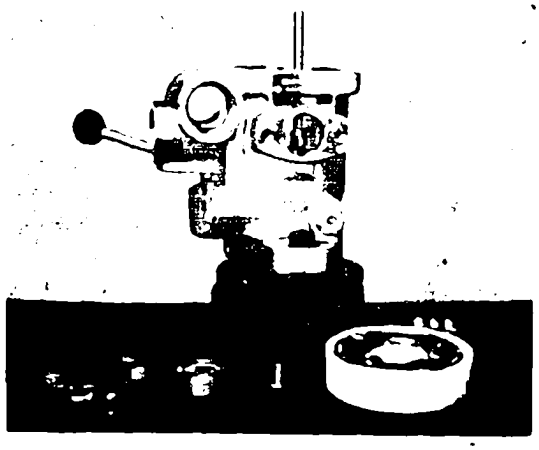
Remove screw plug with gasket.
Bring timing piston into center position and remove connecting pin with auxiliary tool.
Push out timing piston.

Fig. 13



Unscrew overflow valve and gaskets as well as top plug.
Remove O-ring.
Pull out adjusting member.
Remove connecting pin.

Fig. 14

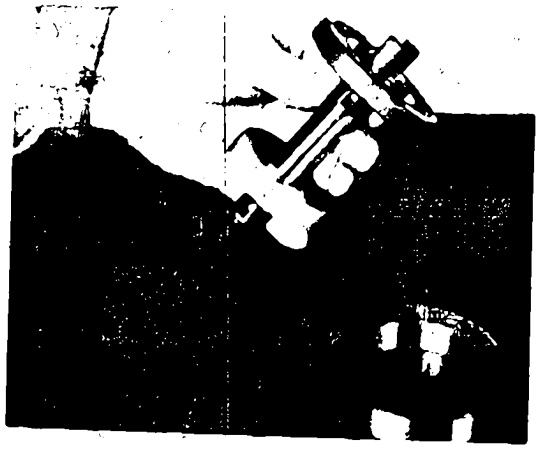


Turn pump housing into vertical position.
Remove face cam and flexible coupling disc.
Remove roller ring and sliding block.
Caution:
Do not allow rollers to drop out.
Remove thrust washer.
Unscrew Phillips screws in support ring.

Fig. 15

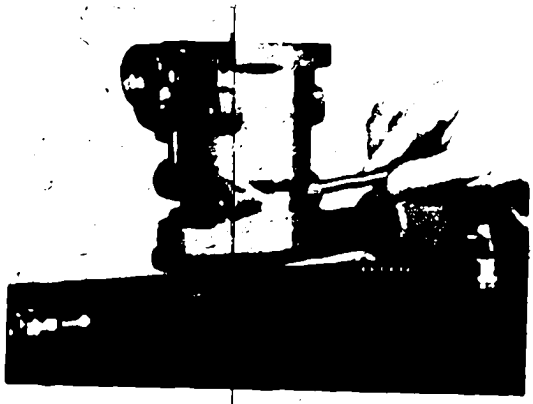
Hold driveshaft and simultaneously tilt pump housing downward.
Remove driveshaft together with support ring and complete vane-type fuel pump downwards ensuring that support ring and eccentric race do not cant.

Fig. 16



Remove eccentric race and place assembly bell (auxiliary tool self-made) over fuel pump impeller.
Invert unit and allow complete fuel pump impeller to drop into assembly bell thus storing the assembly.
Remove key and support ring from drive-shaft.

Fig. 17



Remove pressure control valve screw plug.
Remove helical spring.
Unscrew valve carrier with piston and spring.
Remove O-rings.
Carefully push out poppet and seal with auxiliary mandrel.
Pull oil seal out of pump housing.

Fig. 18

3. Components inspection

Wash all individual parts and clean carefully.

Replace worn or damaged components.
The distributor head is interchangeable as a single unit complete with distributor plunger, spill piston and throttle, the pump housing together with the automatic timing piston, the intermediate housing together with the pressure equalizer piston.

Likewise the roller ring with rollers, roller pins, washers and sliding block as also the fuel pump rotor with vanes and eccentric race are only interchangeable as single units.

Use new seals after each disassembling operation.

These seals are contained in parts sets (internal seals and external seals).

Prior to reassembly, submerge all components in test oil.

O-rings should be coated with tallow (or petroleum jelly) prior to installing.

4. Assembly

Install the support ring, key and complete fuel pump impeller (with assembly bell) on the driveshaft.

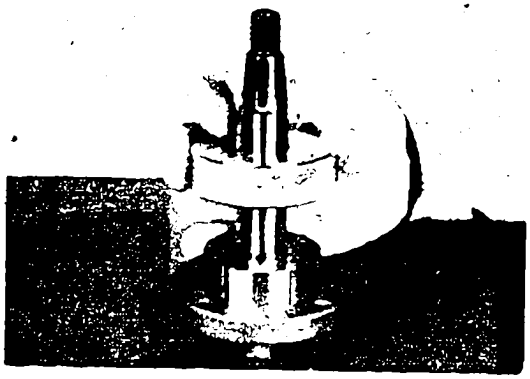


Fig. 19

Install the eccentric race so that for a clockwise-running pump, the letter "L", or for a counterclockwise-running pump, the letter "R" is showing.
Insert a Phillips screw in the bore marked with the letter through the support ring to hold the eccentric race in place.

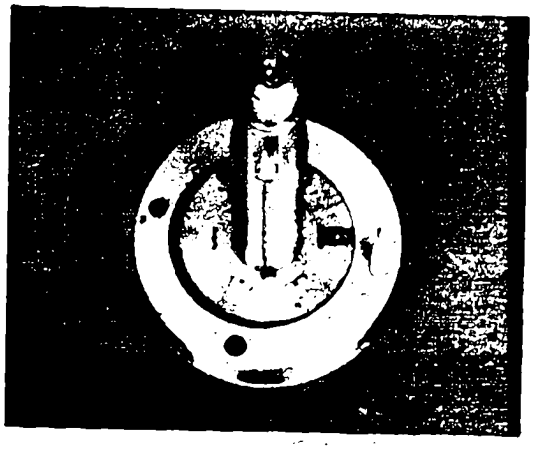


Fig. 20

Press oil seal into position. Secure pump housing to swivel vise 0 681 240 048 using clamping bracket 1 688 120 034 and tilt downword.
Fit protecting sleeve 1 680 300 040 to prevent damage to seal.
Insert pre-assembled driveshaft from below so that the letter on the eccentric race is facing the timing piston bore.

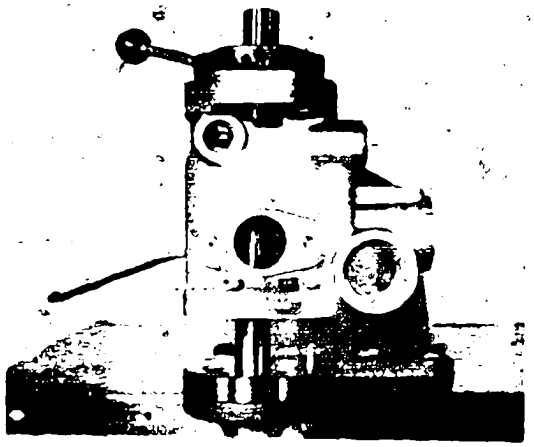


Fig. 21

Remove protecting sleeve.
Holding driveshaft, position pump housing upright.
Secure support ring with Phillips screws.
Insert thrust washer.

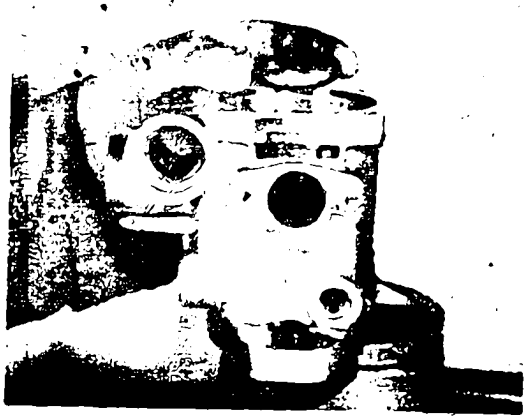


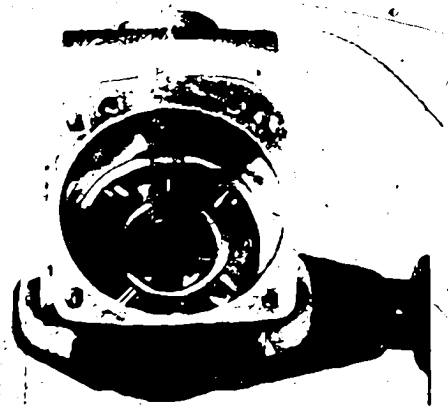
Fig. 22

Carefully install the roller ring in the pump housing with the recess for the sliding block facing the timing piston bore.

Caution :

Do not drop or interchange the rollers.

Fig. 23

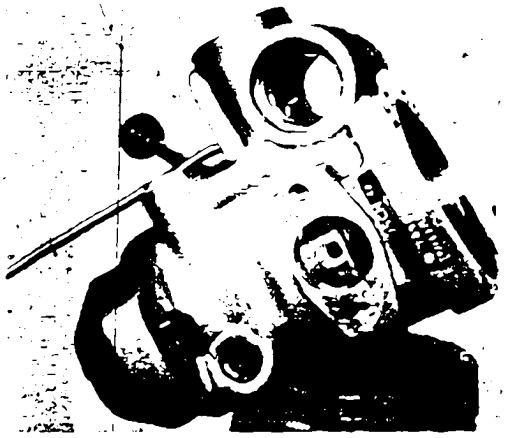


Insert the flexible coupling disc so that the roller pins cannot slide out.

Insert the sliding block into the roller ring in such a way that the milled radial surface is visible and points towards the pump center.

Insert "short" connecting pin into the sliding block.

Fig. 24



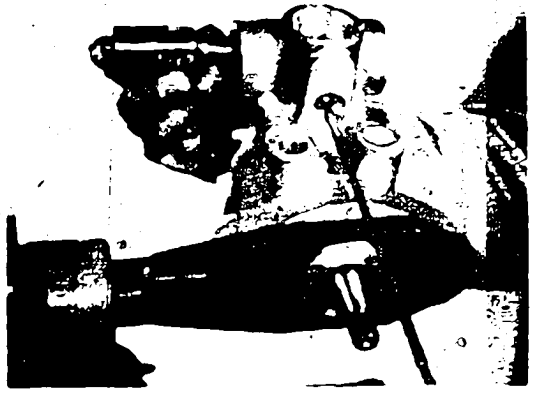
Incline the pump.

Insert adjusting member with the cutout towards the timing piston bore and closed pin hole outwards.

The "short" connecting pin must now engage.

Push "long" connecting pin through assembly bore into the adjusting member until it protrudes approx. 2 mm (5/64 in) out of the cutout.

Fig. 25

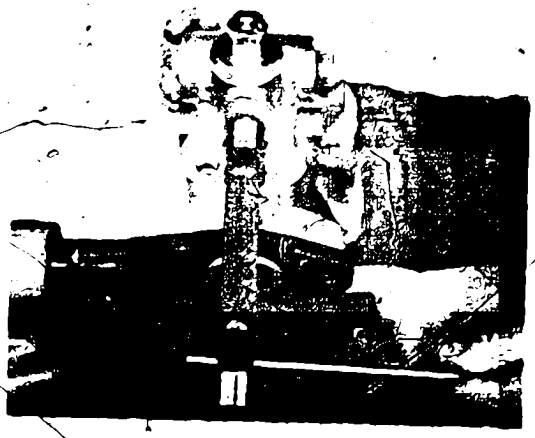


Install the timing piston with sliding block - spring end leading. Observe rotating direction of pump - viewing from drive side.

For clockwise rotation, insert the timing piston from the left, for counterclockwise rotation, from the right.

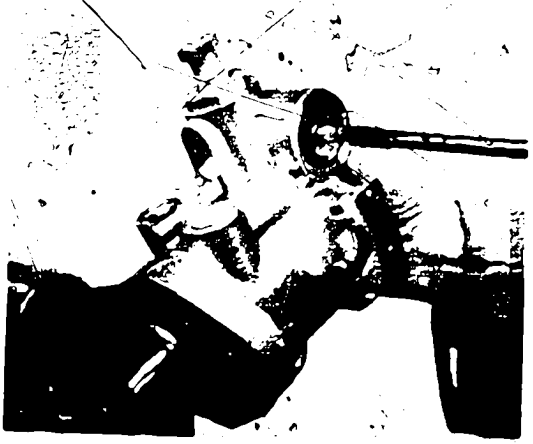
In assembling, position the bore for the sliding block vertically and the groove in the piston towards the adjusting member.

Fig. 26



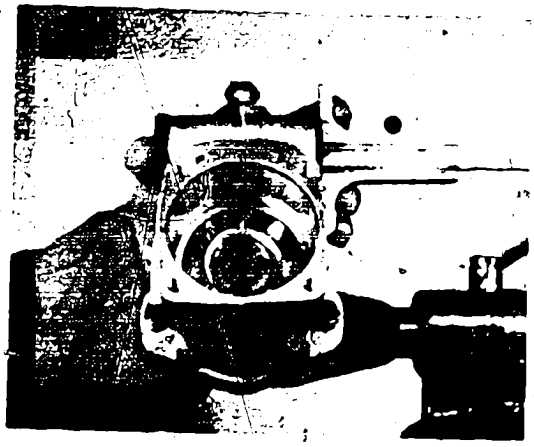
Install top plug with O-ring and overflow valve with gaskets.
Using auxiliary tool, install the "long" connecting pin into the sliding block in the timing piston.
Close off assembly bore with screw plug and gasket. Check timing piston for easy movement.

Fig. 27



Remove fillister-head screw (stop screw) with spring washer and shims, if any, from the timing piston "spring side".

Fig. 28

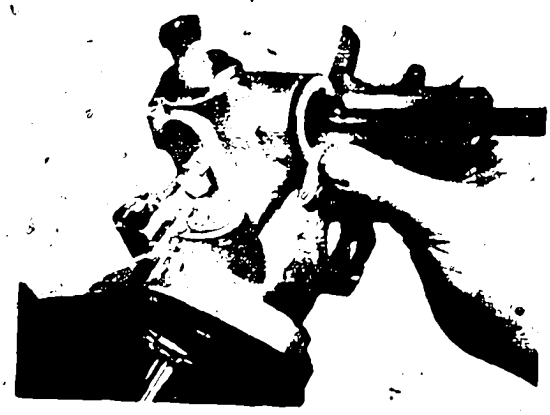


Place stop plate 1 680 022 002 on "spring side".
Screw gauge ring 1 683 458 007 into opposite end and measure the distance to the stop screw with depth gauge. The distance required is given in Test Sheet WPP 001/4..B as Measurement 1.

Fig. 29

Correct dimensional deviations installing shims under the fillister-head screw and the lock washer on the "pressure side".
If the slot of the fillister-head screw is damaged, replace the screw.
Subsequently, screw end plug with O-ring into "pressure side".

Fig. 30



Screw fillister-head screw with lock washer onto "spring side".
Push piston in up to stop.
Screw gouge ring 1 683 458 007 into position and measure the distance to the stop screw with the depth gauge.
The required distance is given in Test Sheet WPP 001/4..B as Measurement II.

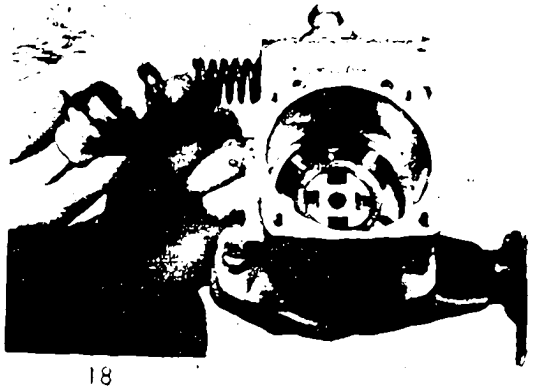
Fig. 31

Correct dimensional deviations by inserting shims under the fillister-head screw and lock washer on "spring side".
If the slot of the fillister-head screw is damaged, replace the screw.

Fig. 32

Leave the gauge ring in the housing and measure timer spring space. (Distance from surface of gauge ring to spring contact surface of piston).
The required length of the spring space is given in Test Sheet WPP 001/4..B as Measurement III.

Fig. 33

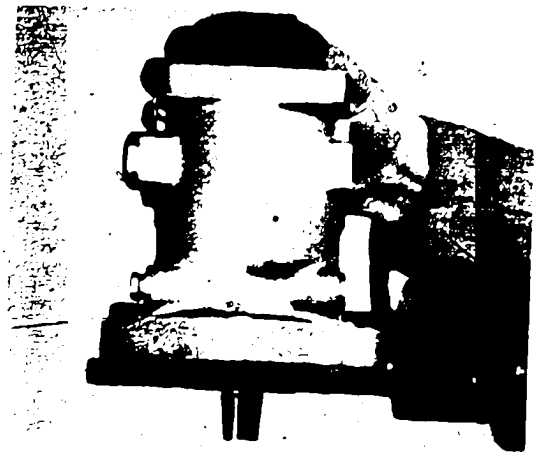


Insert shims having a thickness equal to the difference between the distance required and the larger distance measured into end cap.
Unscrew gouge ring.
Insert helical spring and screw on end cap with O-ring and shims.

Fig. 34

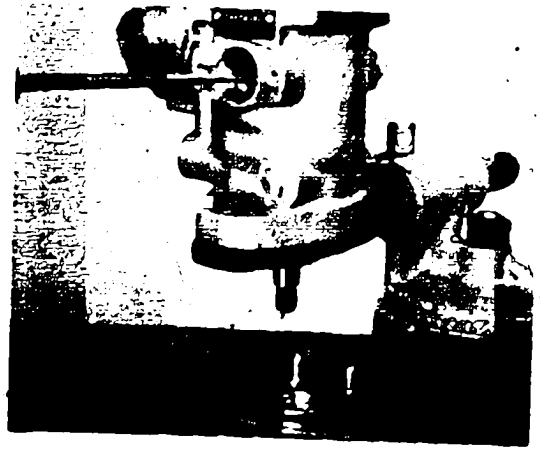
Install screw plug and O-ring in the housing bore (for the pressure control valve) opposite the timing piston spring side.
Insert the helical spring from opposite end.
Insert the small valve spring and the valve piston into the valve carrier with O-ring.
Subsequently attach first the O-ring and then the poppet (taper towards O-ring) onto the pressure control valve using grease and install this assembly.

Fig. 35



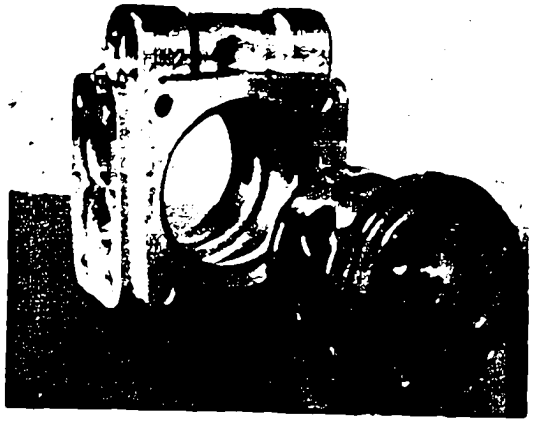
Position pump vertically and install face cam.
Caution:
Align the drive pin in the face cam with the keyway in the driveshaft.

Fig. 36



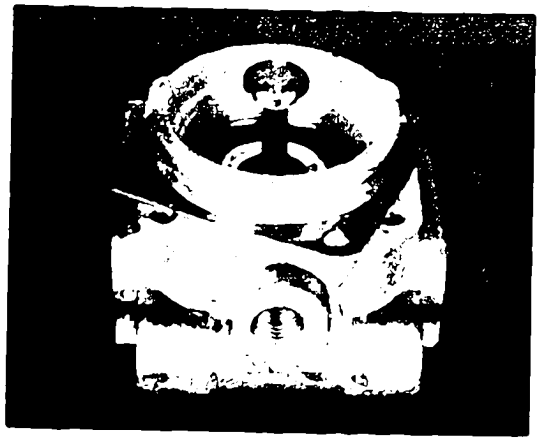
Secure timing pointer to roller ring with fillister-head screw and washer.
Install cover with O-ring and secure with fillister-head screws.

Fig. 37



Insert O-ring into intermediate housing on locating pin side.
Insert O-ring into the groove in the distributor head.
Press the distributor head into the intermediate housing.
Caution:
Note position of locating pin and O-rings.

Fig. 38



Place a shim of 1 mm (0.039") thickness onto pilot side of intermediate housing.
Insert plunger without spring, spring seats and bearing into the distributor head.

Fig. 39

Screw measuring device 1 688 130 045 with gasket into distributor head and install pre-assembled intermediate housing in pump housing.

Caution:
The groove in the plunger foot must engage with the drive pin of the face cam
Put on flange.
Insert hex. socket-head screws with spring washers and tighten.

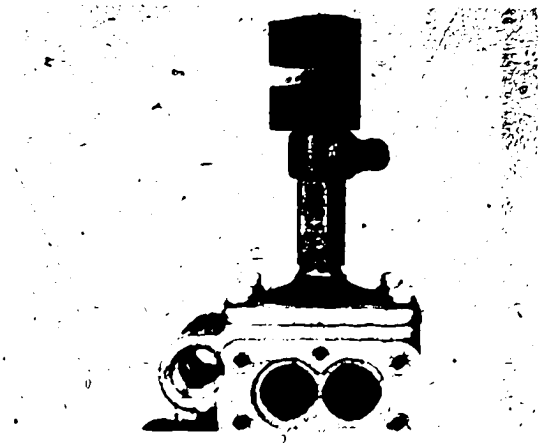


Fig. 40

Position the pump horizontally.
Install screw plug with machined stud and O-ring into pressure equalizer bore on the end opposite the stop plate.
Insert the helical spring and then the equalizer piston with stud end leading into the other end.
Install screw plug with O-ring.

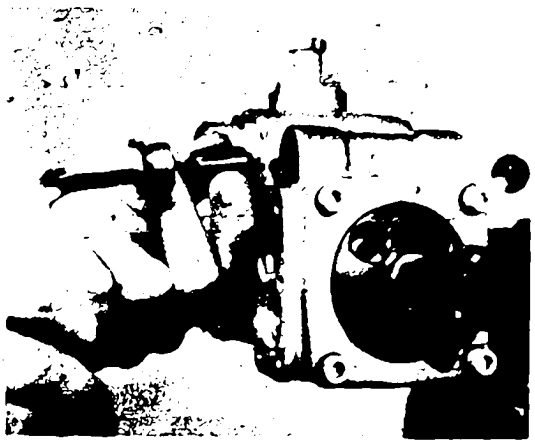


Fig. 41

Insert spill piston into bottom bore for right-mounted control levers, insert spill piston into top bore for left-mounted control levers.
Note:
"Left" or "right" looking from the drive end; "top" means towards the pressure equalizer.

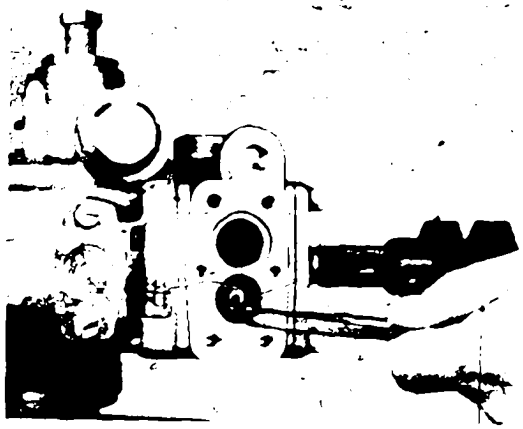


Fig. 42

Introduire l'axe de mesure du dispositif de mesure 1 688 130 047, grand diamètre en avant.
Introduire l'axe de réglage avec goupille d'entraînement sans joint torique dans la douille sans joint torique. Poser la bague de mesure du dispositif 1 688 130 047 et introduire cet ensemble.

Introducir el perno del dispositivo de medición 1 688 130 047 con el diámetro grande delante.
Colocar el árbol de regulación con el pitón de arrastre sin anillo 0 en el casquillo sin anillo 0. Colocar el anillo de medición del dispositivo 1 688 130 047 e introducir esta unidad.

Avec une jauge d'épaisseur de modèle courant, relever la distance comprise entre la bague de mesure (appliquée sur le carter intermédiaire) et le gros épaulement de la douille. Pour cela, pousser la douille vers l'intérieur.
Choisir le ressort de régulation correspondant à la cote d'écartement relevée. (Voir tableau).

Con una galga de tipo corriente en el comercio, medir la distancia entre el anillo de medición (que debe apoyar contra el cuerpo intermedio) y el reborde grande del casquillo. Al hacerlo, apretar el casquillo hacia dentro.
Elegir un resorte de regulación de acuerdo con la medida de la distancia (véase la tabla).

Distance in mm as shown in Fig. 44 Cote relevée en mm suivant fig. 44 Medida de distancia en mm según fig. 44	Former coding by copper plating - - - Ancien symbole par cuivrage - - - - Identificación hasta ahora con cobreado - - -	New coding by color - - - - Nouveau symbole par couleur indélébile à tampon - - - - Identificación nuevo con tinta de sellar - - - -
0,5 - 0,8		
0,8 - 1,1		red/rouge/rojo
1,1 - 1,4		red/rouge/rojo red/rouge/rojo
1,4 - 1,7		blue/bleu/azul
1,7 - 2,0		blue/bleu/azul blue/bleu/azul

A26

Insert measuring plunger of measuring device 1 688 130 047 with large diameter leading.

Insert shaft with drive pin and bushing without O ring.

Place gauge ring of measuring device 1 688 130 047 in position and install this assembly.

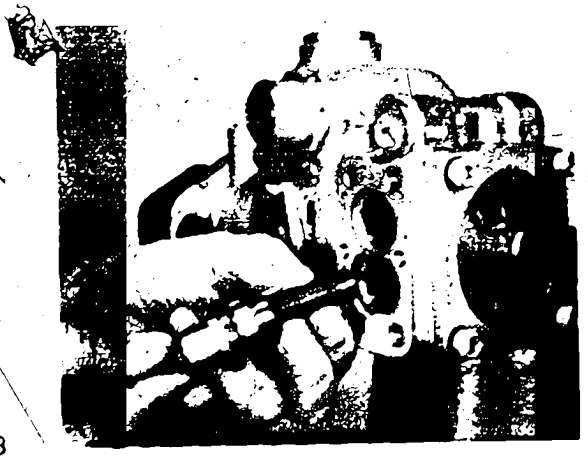


Fig. 43

Using a conventional feeler gauge, measure the distance between the gauge ring (in contact with intermediate housing) and the large shoulder of the bushing. The bushing must be pressed in while taking this measurement.

Select a governor spring according to the distance measured (see table).

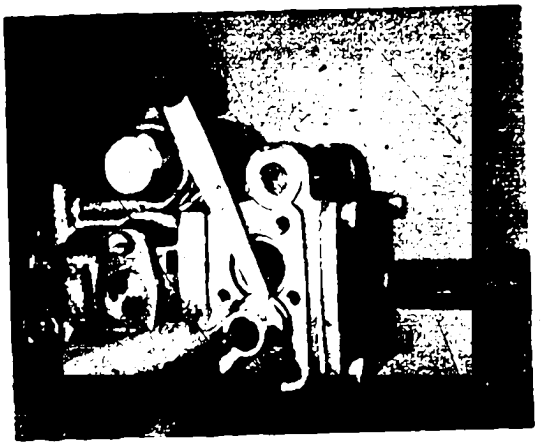
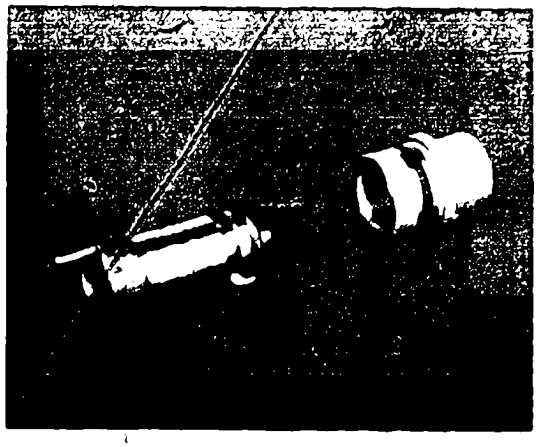
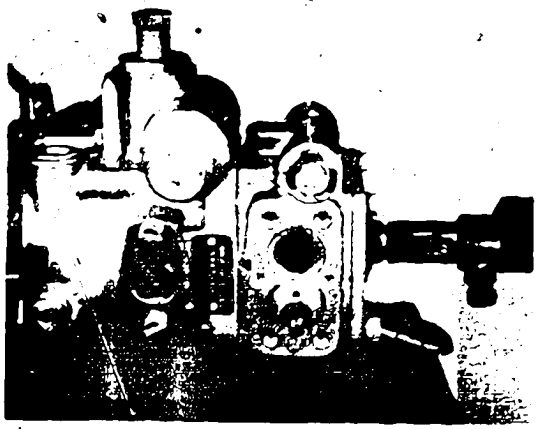


Fig. 44



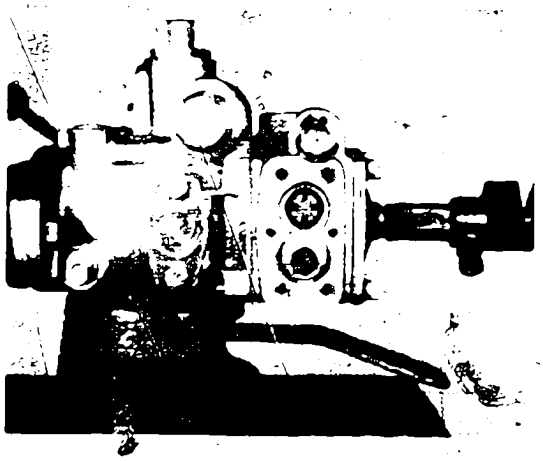
Remove bushing, shaft and measuring device again.
Install O-ring onto shaft using assembling sleeve 1 680 390 000 and slide the bushing with O-ring onto the shaft.

Fig. 45



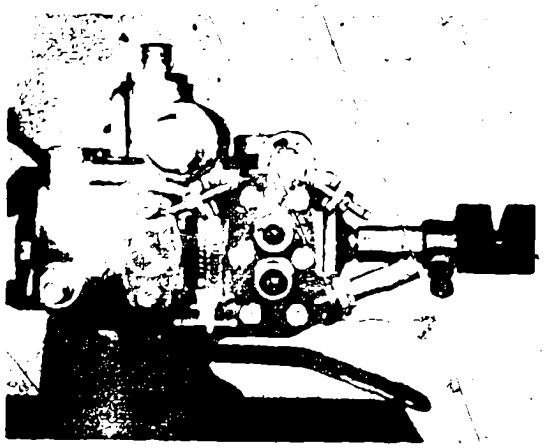
Turn the spill piston so that the groove points towards the throttle bore. Insert governor spring selected into shaft and install this assembly so that the drive pin engages in the groove of the spill piston.
Do not turn shaft.

Fig. 46



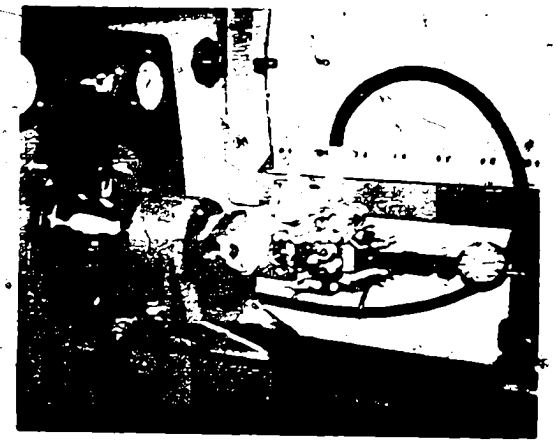
Install throttle with its spacer.
Insert cross-type disc.

Fig. 47



Slide bushing with O-ring onto throttle shaft with O-ring.
Insert helical spring into shaft and insert this assembly so that it engages the cross-type disc.
Caution:
The marking on the threaded insert of the shaft must coincide with the marking on the claw of the throttle.
Mount stop plate securing with flat-head screws.

Fig. 48



Insert gaskets and delivery valves. Screw on delivery valve holders with springs, shims and space fitters as necessary.

For lift to port closure adjustment, mount pump onto injection pump test bench using the appropriate flange and clamping bracket.
Install drive coupling.
Connect test oil supply hose to intermediate housing.
Mount digl indicator onto measuring device and preload in B.D.C. position to 4 mm (0.16 in). (For test bench equipment, see Test Instructions VDT-WPP-161/2 B).

Fig. 49

Start injection pump test bench.
Set supply pressure to max. 0.2 kp/cm^2 (2.8 psi). With the distributor plunger in B.D.C., set dial indicator to "0" (test oil now flows out of the overflow tube of the measuring device).
Turn driveshaft in normal direction of rotation until no test oil flows out of the overflow tube.
Read off measurement on dial indicator.
For checking, turn driveshaft in the reverse direction of rotation.
After a max. of 0.02 mm stroke drop on the dial indicator, test oil must drip again.
If necessary, repeat lift to port closing measurement.
The required lift to port closing is given in the appropriate Test Sheet WPP 001/4.
Correct deviations by exchanging the shims under the intermediate housing.
If the lift to port closing is excessive, use thinner shims, if inadequate, thicker shims.
When setting the lift to port closing, it is advisable to aim at the lower tolerance limit.
Carry out final measurement check.

Fig. 50

Mount pump onto swivel vise again. Remove measuring device and, close off bore in distributor head with screw plug and special gasket.
Unscrew hex. socket head screws and lift off complete intermediate housing.

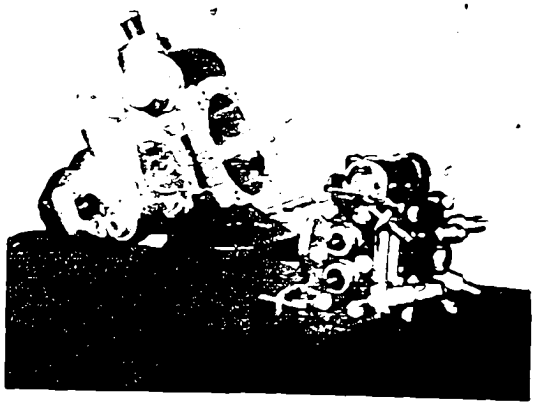


Fig. 51

Position pump vertically.
With face cam in B.D.C., measure the distance from the joint face on pump housing - without shims - to the contact surface for plunger foot.
Record measurement.

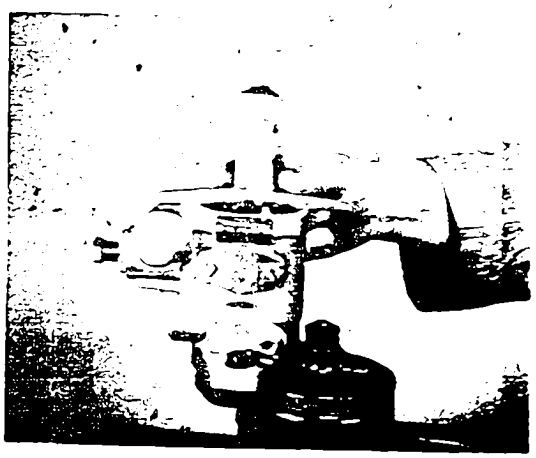


Fig. 52

Withdraw plunger from distributor head. Clamp the distributor head, intermediate housing and the appropriate amount of shims together using 2 screws.
Insert bearing, "large" spring seat - ridge towards bearing -, spacer bushing 1 680 300 039 (in place of the spring), "small" spring seat - ridge facing outward -, and plunger.

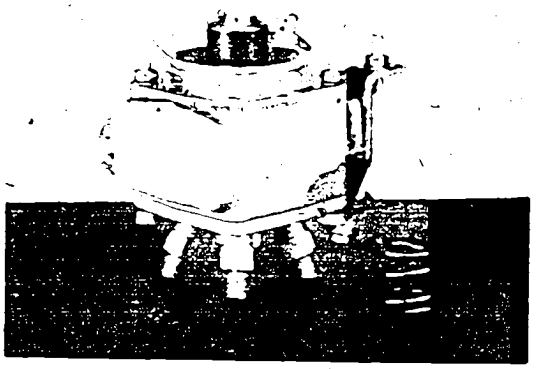


Fig. 53

Measure distance from shims to flat surface of plunger foot with depth gauge.
Caution:
Do not tilt depth gauge on inclined plunger foot.
The measurement established must agree with that recorded (see Fig. 52).

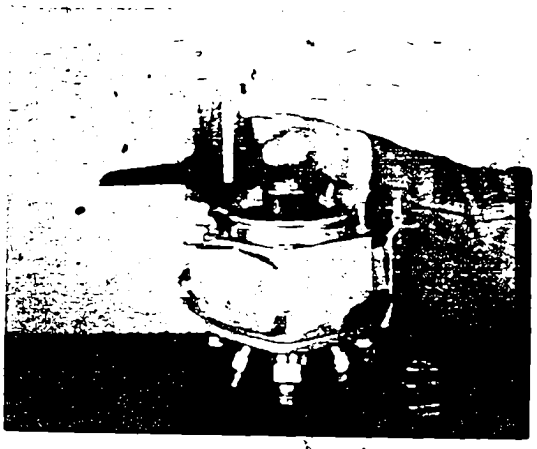


Fig. 54

B2

Correct dimensional deviations by exchanging the "small" spring seat. Replace spacer bushing 1 680 300 039 with the spring.
Unscrew clamping screws.

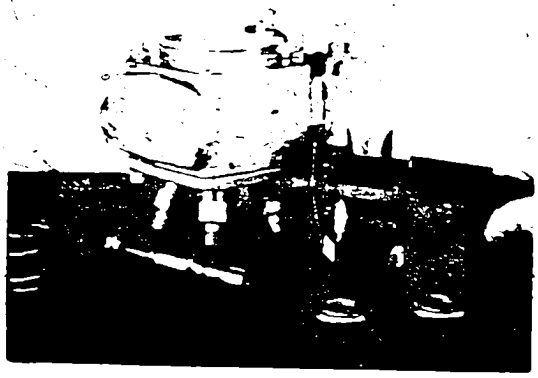


Fig. 55

Install O-ring onto intermediate housing.
Install complete intermediate housing onto pump housing and secure with hex. socket-head screws.
Caution:
The groove in the plunger foot must engage the drive pin in the face cam.

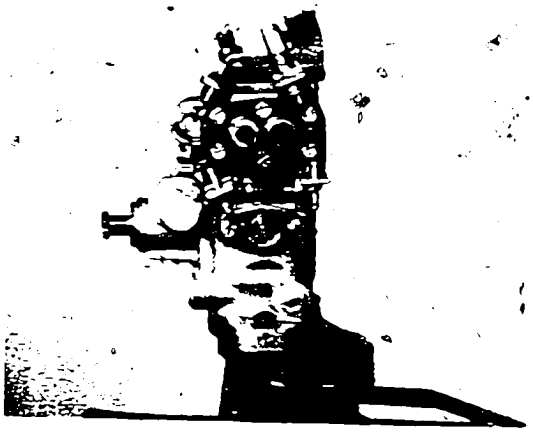


Fig. 56

Secure fuel line with inlet union screw with strainer and gaskets to pump housing, inlet union screw with bleeder screw and gaskets to intermediate housing.

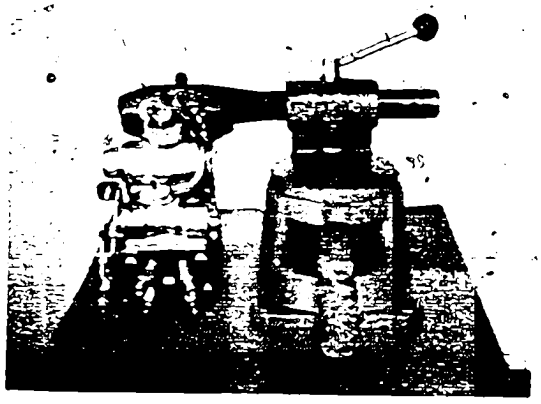


Fig. 57

Install the torsion springs.

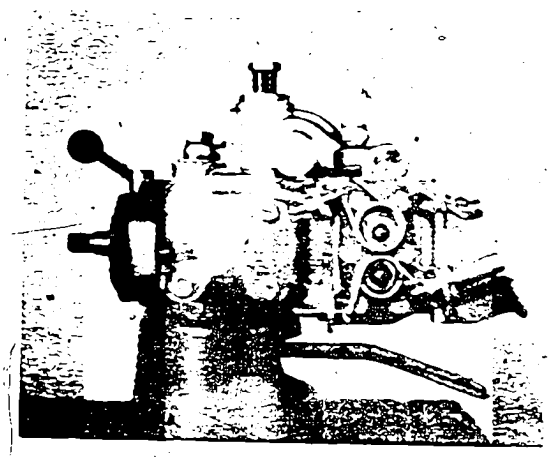
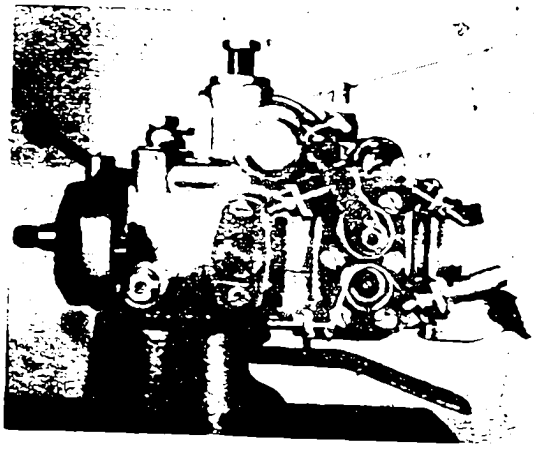


Fig. 58



Install speed control lever.
Engage torsion spring.

Fig. 59

Fit washer and place stop lever in vertical position. Do not turn shaft of spill piston.
Fit lock washers.
Secure with hex. nuts.
Engage torsion spring.

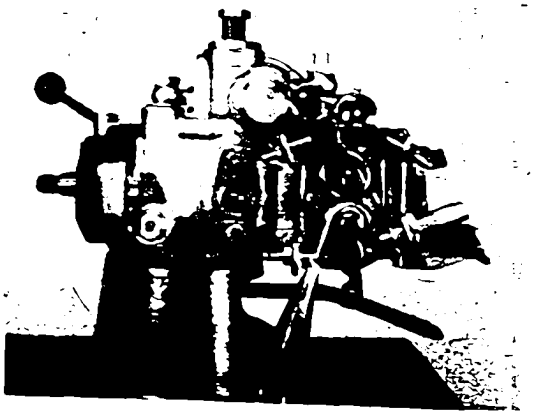
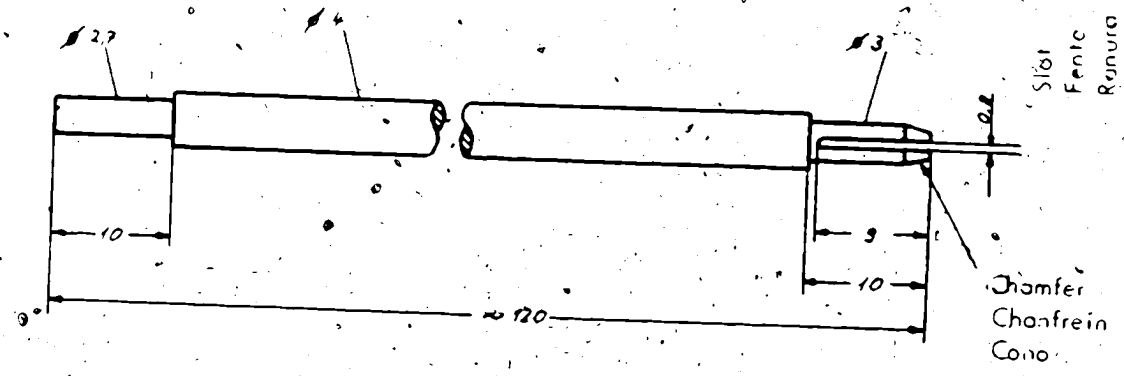


Fig. 60

5. Auxiliary tools

Self-produced according to sketches below.



For removing and installing the pin connecting the adjusting member to the sliding block in the timing piston.

Pour le montage et le démontage de la goupille cylindrique reliant l'axe rotatif au coulisseau du piston d'avance à l'injection.

Para desmontar y montar el pasador cilíndrico que une el perno giratorio con el taco deslizante del émbolo del variador de avance.

B4

Monter le levier de commande de vitesse.
Accrocher le ressort de torsion.

Colocar la palanca de velocidad.
Enganchar el resorte de torsión.

Poser une rondelle et monter le levier stop en position verticale. Ce faisant, veiller à ne pas faire tourner l'axe de réglage du tiroir de régulation.
Poser des rondelles Grower.
Visser les écrous hexagonaux et les bloquer.
Accrocher le ressort de torsion.

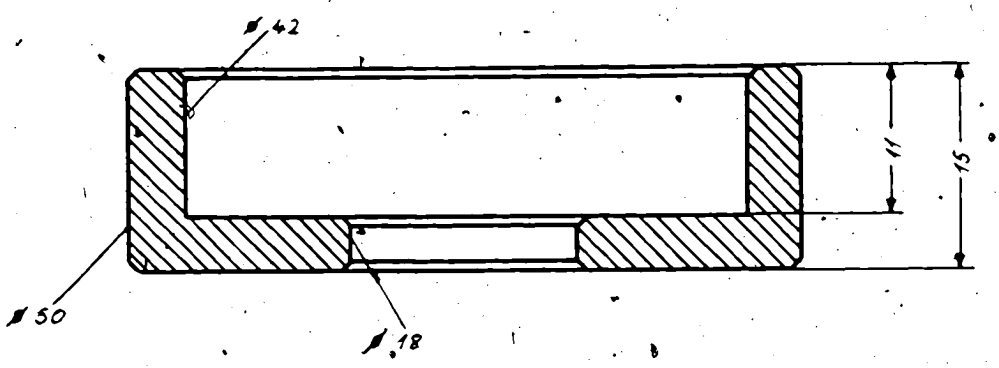
Colocar la arandela y superponer la palanca de parada en posición vertical. Al hacerlo, no girar el árbol de la corredera de regulación.
Colocar los anillos Grover.
Enroscar y fijar las tuercas hexagonales.
Enganchar el resorte de torsión.

5. Outils auxiliaires

à exécuter d'après les croquis ci dessous.

5. Herramientas auxiliares

Preparar conforme a los croquis siguientes.



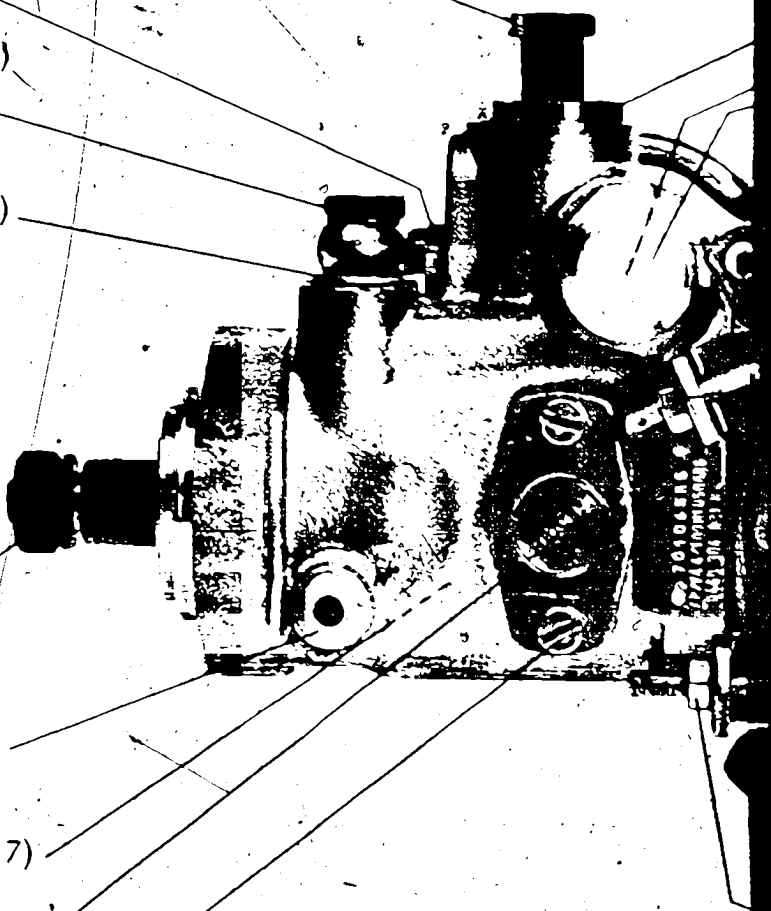
Assembly bell for fuel pump rotor and vanes.

Coquille de montage pour la roue à palettes de la pompe d'alimentation avec ses palettes.

Cubierta de montaje para el rodete, con aletas, de la bomba alimentadora.

B5

Torque values in kgm (lb.ft.) - Couple de serrage en



(1) 2 - 2,5 (14.5 - 18.1)

(2) 2 - 3 (14.5 - 21.7)

(3) 2 - 2,5 (14.5 - 18.1)

(4) 4 - 4,5 (28.9 - 32.5)

(5) 6 - 7 (43.4 - 50.6)

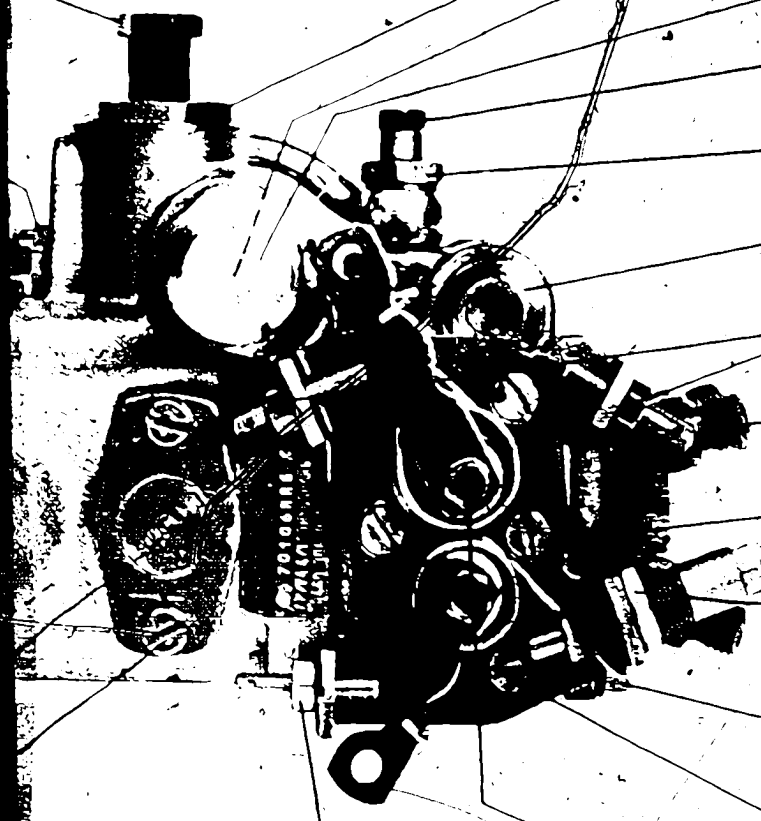
(6) 0,8 - 0,9 (5.8 - 6.5)

(7) 0,55 - 0,65 (4.0 - 4.7)

(8) 0,2 - 0,3 (1.5 - 2.2)

(9) 0,5 - 0,6 (3.6 - 4.3)

Couple de serrage en mkg - Pares de apriete en kgm



3 - 4 (21.7 - 28.9) (10)

0,4 - 0,55 (2.9 - 4.0) (11)

3 - 4 (21.7 - 28.9) (12)

0,5 - 0,6 (3.6 - 4.3) (13)

2 - 2,5 (14.5 - 18.1) (14)

2,5 - 3,5 (18.1 - 25.3) (15)

0,5 - 0,6 (3.6 - 4.3) (16)

4 - 4,5 (28.9 - 32.5) (17)

4,5 - 5,5 (32.5 - 39.8) (18)

1,4 - 1,8 (10.1 - 13.0) (19)

1,1 - 1,3 (8.0 - 9,4) (20)

0,6 - 0,75 (4.3 - 5.4) (21)

0,5 - 0,7 (3.6 - 5.1) (22)

0,5 - 0,6 (3.6 - 4.3) (23)

1 Overflow valve
2 Screw plug
3 Inlet union screw
4 Thread insert
5 Hex. nut with coupling mounted
6 Screw plug and valve carrier
7 Flat-head screws
8 Fillister-head screw for securing pointer
9 Fillister-head screws
10 Screw plug
11 Fillister-head screws (Stop screws) on automatic timing piston
12 Screw plugs
13 Bleeder screw
14 Inlet union screw
15 Screw plugs
16 Hex. nuts
17 Delivery valve holders
18 Screw plug
19 Hex. nut
20 Hex. socket-head cap screws
21 Flat-head screws
22 Hex. nuts
23 Hex. nut

1 Soupape de décharge
2 Bouchon fileté
3 Vis creuse
4 Tubulure filetée
5 Ecrou hexagonal dans le cas d'accouplement monté
6 Bouchon fileté et porte soupape
7 Vis tête fraisée
8 Vis tête cylindrique pour fixation de l'index
9 Vis tête cylindrique
10 Bouchon fileté
11 Vis tête cylindrique (vis butée) du piston de l'avance à l'injection
12 Bouchons filetés
13 Vis de purge
14 Vis creuse
15 Bouchons filetés
16 Ecrous hexagonaux
17 Raccords de tuyauterie
18 Bouchon fileté
19 Ecrou hexagonal
20 Vis à six pans creux
21 Vis tête fraisée
22 Ecrous hexagonaux
23 Ecrou hexagonal

1 Válvula de rebose
2 Tapón roscado
3 Tornillo hueco
4 Racor
5 Tuerca hexagonal con la pieza del acoplamiento montada
6 Tapón roscado y portaválvula
7 Tornillos avellanados
8 Tornillo de cabeza cilíndrica para sujetar el indicador
9 Tornillos de cabeza cilíndrica
10 Niple (de reducción)
11 Tornillos de cabeza cilíndrica (tornillos de tope) del émbolo del variador de avance
12 Tapones roscados
13 Tornillo de purga
14 Tornillo hueco
15 Tapones roscados
16 Tuercas hexagonales
17 Racores de conexión
18 Tapón roscado
19 Tuerca hexagonal
20 Tornillos de hexágono interior
21 Tornillos avellanados
22 Tuercas hexagonales
23 Tuerca hexagonal

BOSCH
GERMANY

REPAIR INSTRUCTIONS
INSTRUCTIONS DE REPARATION
INSTRUCCIONES DE REPARACION

VDT - WJP 161 USA 3 B 1st supplement EP

Edition 8.1988
Translation of German edition of 4.88

Distributor - type Fuel Injection Pump
Pompe distributrice
Bomba distribuidora de inyección
EP/VA..H..A.. 0 460..

ROBERT BOSCH GMBH · STUTTGART GERMANY

Following are modifications which have been carried out in various versions of the distributor-type fuel injection pump EP/VA..H.. since the modification...

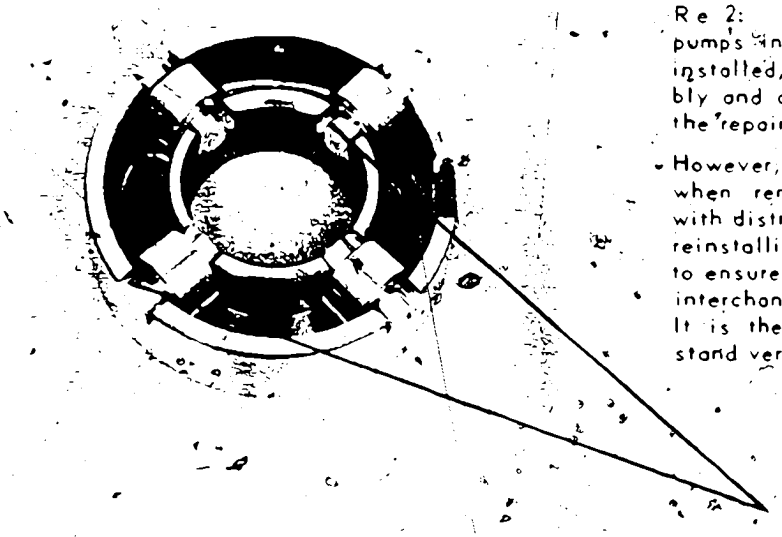
1. Longer timing piston
2. Slotted roller ring
3. Securing of "long" cylindrical pin in automatic timer (connecting pin between adjusting member and timing piston)
4. Modified eccentric race of fuel pump
5. Instead of the 5 different governor springs used up to now, only one governor spring with 5 different shims
6. Stop plate now mounted with 4 instead of 6 screws
7. Rust-protected design
8. Piston spring preload
9. Inlet union screw with sieve

These modifications demand a number of new illustrations and texts to the repair instructions VDT-WJP 161 3B as here stated.

Understandably, the instructions VDT-WJP 161 2B and 3B remain valid for fuel injection pumps produced up to now and in actual service.

Re 1: Installing the longer automatic timing piston eliminates measuring of the total piston travel (Fig.28...Fig.32). The total travel specified for a given pump design results from the use of the corresponding end cap and plug on "spring" (advance) and "pressure" (retard) side. It is therefore essential to use the end cap and plug quoted in the spare parts list for the pump under repair.

The method for measuring the timer spring space remains as described in the repair instructions under Fig. 33 and Fig. 34.



Now slots instead of bores
Encoches au lieu d'alésages
Ahora, ranuras en vez de agujeros

Fig. 1 Slotted roller ring
Bague-support des galets à encoches
Anillo de rodillos ranurado

Re 2: On distributor-type fuel injection pumps in which the slotted roller ring is installed, there is no change in disassembly and assembly procedures described in the repair instructions.

However, particular attention is advisable when removing the intermediate housing with distributor head and when removing or reinstalling the roller ring into the housing to ensure that the rollers do not drop out or interchange positions.
It is therefore essential for the pump to stand vertically.

Re 3: Securing of the long connecting pin (connecting pin between adjusting member and timing piston) made a number of new parts necessary; their arrangement is shown in Fig. 2.

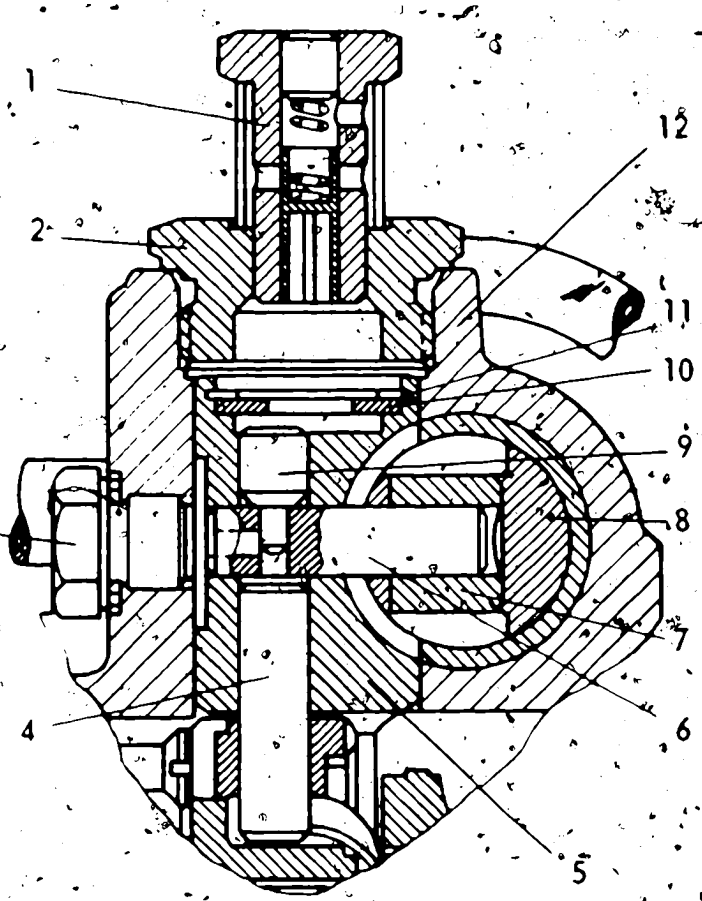


Fig. 2

1. Overflow valve
2. Top plug
3. Screw plug for assembling bore
4. Shorter connecting pin
5. Adjusting member
6. Longer connecting pin
7. Slider
8. Timing piston
9. Securing pin
10. Washer
11. Circlip
12. Pump housing

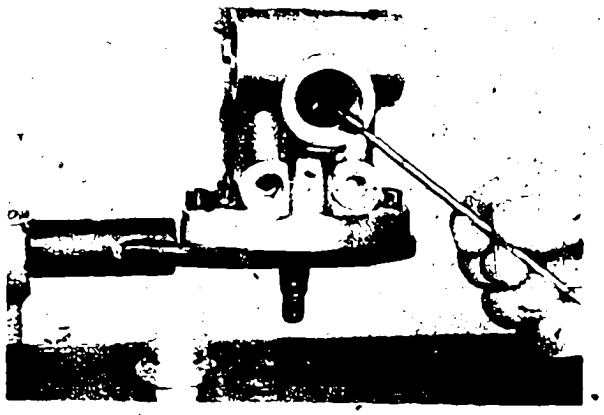


Fig. 13!1

Due to the arrangement of these new components, a number of procedures in disassembly and assembly of the injection timer as given in the original repair instructions under Fig. 13, 25, 26 and 27 have changed.

Position pump vertically.

Unscrew overflow valve with gasket and top plug.

Remove O-ring.

Remove circlip from adjusting member.

Also remove washer and with auxiliary tool withdraw securing pin out of adjusting member.

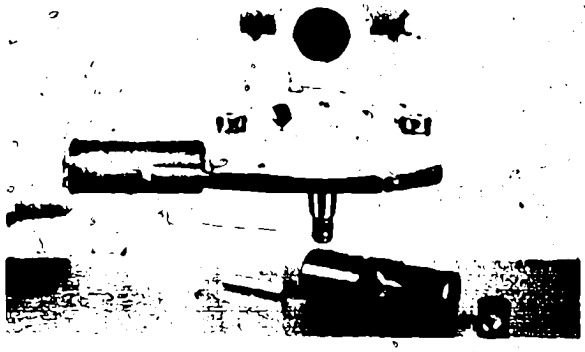


Fig. 13.2

Unscrew screw plug with gasket.

Bring timing piston into center position and withdraw long connecting pin with auxiliary tool.

Take timing piston out of housing. Take out adjusting member and then short connecting pin.

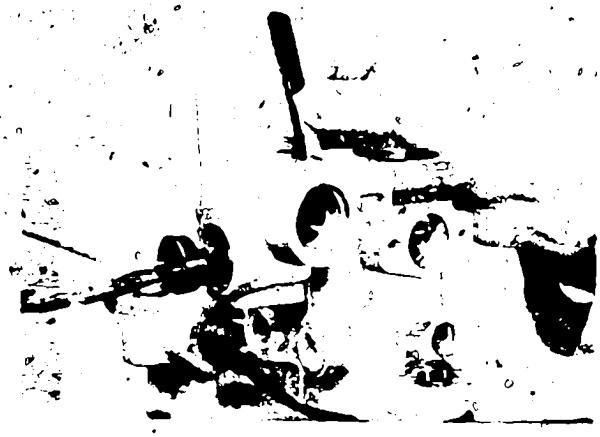


Fig. 25.1

Place pump in vertical position.

Insert adjusting member with the cut-out towards the timing piston bore and recess end towards outside. The short connecting pin must engage.

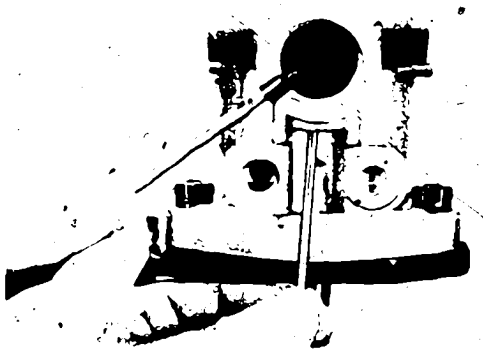


Fig 26_1

Install the timing piston with slider (for clockwise-rotating pump, spring end to right; for counterclockwise-rotating pump, spring end to left).

Insert piston and bring into center position. Insert connecting pin with transverse hole through assembling bore and the adjusting member into the slider bore in the timing piston.

Insert securing pin in adjusting member. When doing this, rotate connecting pin with auxiliary tool so that the securing pin tip engages into the connecting pin hole.

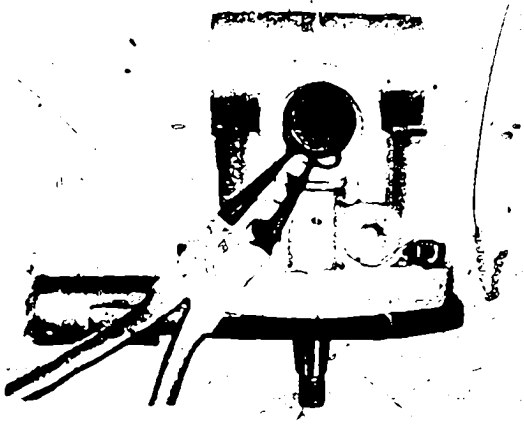


Fig. 27_1

Insert washer onto adjusting member, then secure with circlip.

Screw on top plug with O-ring and overflow valve with gaskets.
Close up assembling bore with screw plug and gasket.
Check injection timer for easy movement by moving the piston.

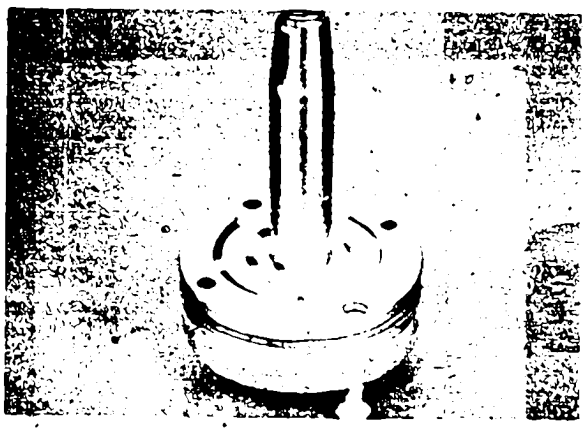


Fig. 20_1

Re 4: On the new fuel pump eccentric race the rotating direction markings "R" and "L" have been left out. Instead, the hole marked up to now with a letter on the side "L" is countersunk to 6 mm (0.236 in.) diameter and 2 mm (0.079 in.) deep.

This changes Fig. 20 with text in the repair instructions as follows:

Place the eccentric race so that for a clockwise-running pump the countersink is visible or for a counterclockwise-running pump, not visible.

Insert a Phillips screw into the countersunk hole through the support ring to hold the eccentric race in place.

The groove machined into the circumference of various eccentric races is of no importance in assembling.

Re 5; Instead of the 5 governor springs for one pump type – packed in bag as spare parts set – every pump type now has only one spring, the smallest of the 5 springs used up to now, and 5 compensating washers, also supplied in bags as a spare parts set.

The required installing length (spring and washer) established in accordance with Fig. 44 of the repair instructions must therefore be adjusted by inserting one of the washers supplied between spring and spill piston.

The 5 different washers are supplied in increments of 0.2 mm (0.008 in.) thickness. Select the washer required from the table below.

Dimensions established as per Fig. 44 mm	Thickness of washer required mm
0 – 0.2	1.4
0.2 – 0.4	1.2
0.4 – 0.6	1.0
0.6 – 0.8	0.8
0.8 – 1.0	0.6

Re 6: Securing the stop plate with 4 instead of 6 screws has no influence on the repair of the distributor-type injection pump.

Re 7: For pump designs with rust prevention, all parts within the fuel-filled interior of the distributor pump are rust protected.

Depending on their function, these parts are burnished, cadmium-plated, anti-friction bonderized or produced from stainless steel or tombac (red brass).

Parts not rust protected are interchangeable against those with rust protection.

Exception: The items 82 (spring seat), 83 (thrust needle bearings) and 84 (spring seat) in the spare parts list can only be replaced as a group by the rust-protected set 82 (spring seat), 84 (spring seat), 214 b (tombac washer) and 214 a (washer).

In this case, the piston spring must be remeasured (Fig. 51 - 55 of repair instructions). In the text to Fig. 53, the sequence of the parts changes as follows:

Insert "large" spring seat, spacer bushing 1 680 300 039 (instead of spring), "small" spring seat – ridge facing outward –, tombac washer, washer and piston.

Re 8: The test to Figs. 52-55 of the repair instructions refers to an installed face cam with 2.5 mm (0.11 in.) cam height and a required spring fitting length of 24 mm (0.95 in.) (spacer bushing 1 680 300 039 – 24 mm long).
Where cam heights deviate, the spring fitting length changes accordingly (e.g. for 2.2 mm – 23.7 mm).

To maintain the usability of the 24 mm spacer bushing, distributor-type injection pumps with other face cams (larger or smaller cam height) require a recalculation, i.e. when selecting the small spring seat according to Fig. 54, the dimension difference from 2.5 mm cam height must be subtracted or added.

Example: Face cam with 2.2 mm cam height:

The dimension measured and set according to Fig. 54 and 55 must be greater than the dimension established under Fig. 52 by the difference = 0.3 mm. Where face cams have a larger cam height than 2.5 mm, the difference must be subtracted.

Therefore, whenever a distributor-type fuel injection pump is repaired, the cam height (lift) must be measured so that the correct spring fitting length can be adjusted in installing the piston spring.

Re 9: The inlet union screw with sieve (Fig. 131 of spare parts list VDT-EVP 161/0) used up to now for the fuel pump outlet of the pump housing is replaced by a union screw without sieve.

The union screw on the inlet of the intermediate housing (Fig. No. 132 of spare parts list) is replaced by a union screw with sieve. The head of this union screw with sieve is 5 mm (0.197 in.) higher.
The text to Fig. 57 of the repair instructions therefore changes as follows:

Secure fuel line with union screw and gaskets to pump housing and unloh screw with sieve and bleeder screw and gaskets to intermediate housing.

VDT – WJP 161/3 B | 2nd supplement
Edition 1.70
Translation of German edition of 6.69
REPAIR INSTRUCTIONS

EP

BOSCH

DISTRIBUTOR-TYPE FUEL INJECTION PUMP
EP/VA.. H.. 0 460..

The text referring to Fig. 41 of repair instructions VDT-WJP 161/3B only applies to distributor pumps with stop plate fitted on the right (viewed from drive end).

However, since the position of the pressure equalizer piston does not change regardless of the fitting side of the stop plate, the text referring to Fig. 41 must be modified.

Please cut out the following text and attach it to your repair instructions next to Fig. 41.

Position the pump horizontally.

Install screw plug with machined stud or countersink for spring and O-ring into pressure equalizer bore on the L.H. side of the intermediate housing (viewed from the drive end - timing piston at top).

Insert the helical spring and then the pressure equalizer piston, stud foremost into the other end.

Install screw plug with O-ring.

Printed in Germany - Imprimé en Allemagne 8.89 Fd

ROBERT BOSCH GMBH · STUTTGART GERMANY

BOSCH

REPAIR INSTRUCTIONS

EP

VDT-WJP 161/3 B
Edition 1 Sup. 3

Distributor-type Fuel Injection Pump
0 460 . . EP/VA . . H . . A

Additional text for Fig. 19 (page 12)

If the fuel pump impeller has a larger chamfer on one side of the bore than on the other, the following installation instructions should be noted:
The larger bore chamfer must face away from the drive end towards the driver end
(towards cam ring).

Additional text for Fig. 40 (page 22)

If the flange is ribbed on one side, it must be fitted such that this side is visible.

Text alteration for Fig. 48 (page 26)

Slide bushing with O-ring onto throttle shaft with O-ring.
Insert helical spring in the shaft and insert this assembly such that it engages the cross-type disc.

Note:

If there is a marking on the threaded end of the throttle shaft, it must be aligned with the marking on the claw of the throttle.

Mount stop plate and secure with countersunk flat bolts.

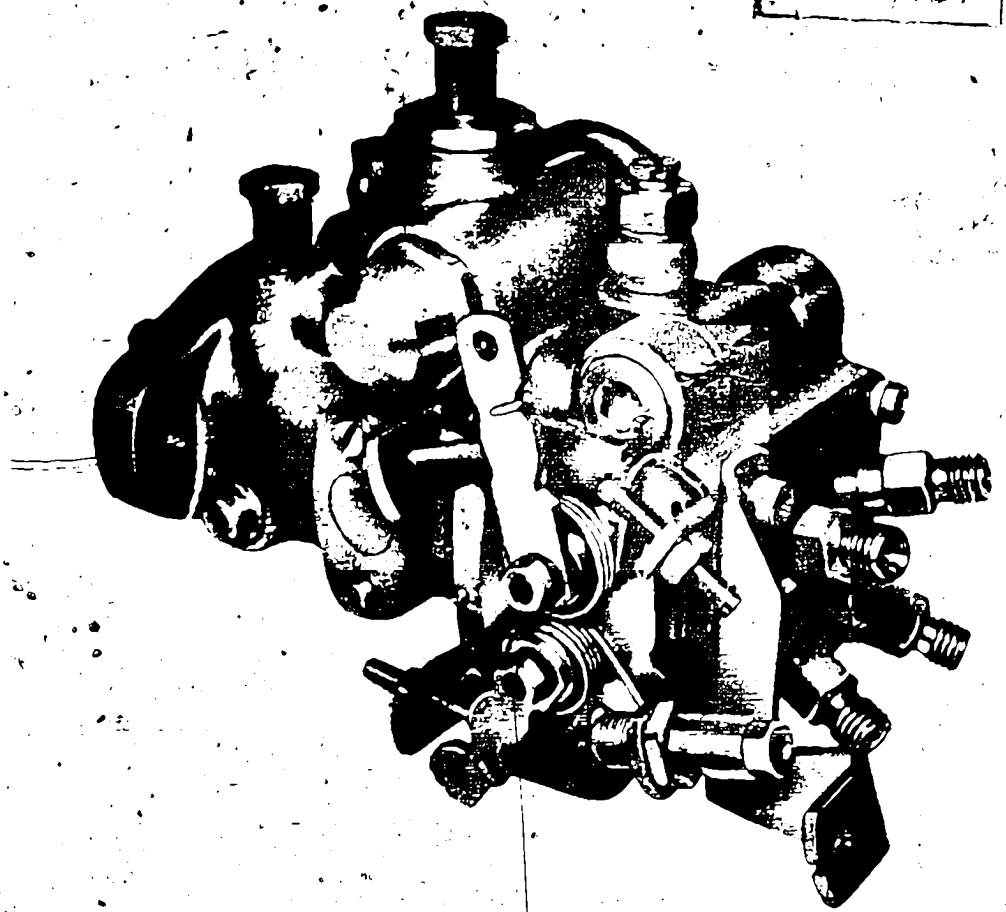
Robert Bosch GmbH 7 Stuttgart Postfach 50 Germany (3 71)
Printed in Germany
Imprimé en Allemagne Fac. Fed. par Robert Bosch GmbH Hausdruckerei

BOSCH

TEST INSTRUCTIONS
INSTRUCTIONS D'ESSAI
INSTRUCCIONES DE ENSAYO

46

VDT-WPP 161/3 B/F/SP
Éd. 5.70



0 460..

EP/VA..H..B..

Distributor-type fuel injection pump
Pompe distributrice d'injection
Bomba de inyección distribuidora

B18

CONTENTS

Page	1	1. Test equipment
	4	2. Test conditions
	5	3. Test specification sheet
	10	4. Test procedure
	24	5. Checking
	28	6. Manifold pressure compensator
	38	7. Final operations

SOMMAIRE

Page	1	1. Equipement d'essai
	5	2. Conditions d'essai
	6	3. Feuille de valeurs d'essai
	11	4. Processus d'essai
	25	5. Vérification
	29	6. Butée de pression de charge
	39	7. Opérations finales

INDICE

Página	1	1. Equipo de ensayo
	5	2. Condiciones de ensayo
	7	3. Modelo de hoja de valores de ensayo
	11	4. Proceso de ensayo
	25	5. Revisión
	29	6. Tope de presión de carga
	39	7. Operaciones finales

B19

1. TEST EQUIPMENT (see also offer sheet)	Part No	Type No.
1 Clamping bracket	1 688 010 010	EFEP 157
1 Intermediate flange (see offer sheet)	1 688 720 . . .	EFEP 157.
6 Test nozzles	0 681 443 014	EFEP 182
6 Test nozzle holders — 150 kgf/cm² (2130 psi) 1 off 200 kgf/cm² (2840 psi)	1 688 901 000	EF 8511/9 G
6 Fuel-injection tubings (6 x 2 x 840 mm) see offer sheet	1 680 750 . . .	EFEP 198
1 Testing device (pressure gauge kit with fittings)	1 688 130 075	EFEP 495 A
1 Timing-piston-travel gauge (short piston)	1 688 130 046	EFEP 459
1 Timing-piston-travel gauge (long piston)	—	KDEP 1000

Tests can also be carried out on test stands

EFEP 5 with accessory set	1 687 000 008	EFEP 491
EFEP 25 with accessory set	1 687 000 009	EFEP 492

in accordance with VDT-WPP 161/1 B

---

1. EQUIPEMENT D'ESSAI (voir également feuille d'offre)	Référence	Type
1 Equerre de fixation	1 688 010 010	EFEP 157
1 Flasque intermédiaire (voir feuille d'offre)	1 688 720 . . .	EFEP 157.
6 Injecteurs d'essai	0 681 443 014	EFEP 182
6 Porte-injecteur (150 kgf/cm², 1 unité à 200 kg/cm²)	1 688 901 000	EF 8511/9 G
6 Tuyauteries de pression (6 x 2 x 840) voir feuille d'offre	1 680 750 . . .	EFEP 198
1 Dispositif d'essai (groupe de manomètres avec éléments de raccordement)	1 688 130 075	EFEP 495 A
1 Dispositif de mesure du déplacement de l'avance variable à l'injection (piston court)	1 688 130 046	EFEP 459
1 Dispositif de mesure du déplacement de l'avance variable à l'injection (piston long)	—	KDEP 1000

L'essai peut également être exécuté sur les bancs d'essai suivants

EFEP 5 avec jeu d'accessoires	1 687 000 008	EFEP 491
EFEP 25 avec jeu d'accessoires	1 687 000 009	EFEP 492

suivant les instructions données dans VDT-WPP 161/1 F — 1er supplément.

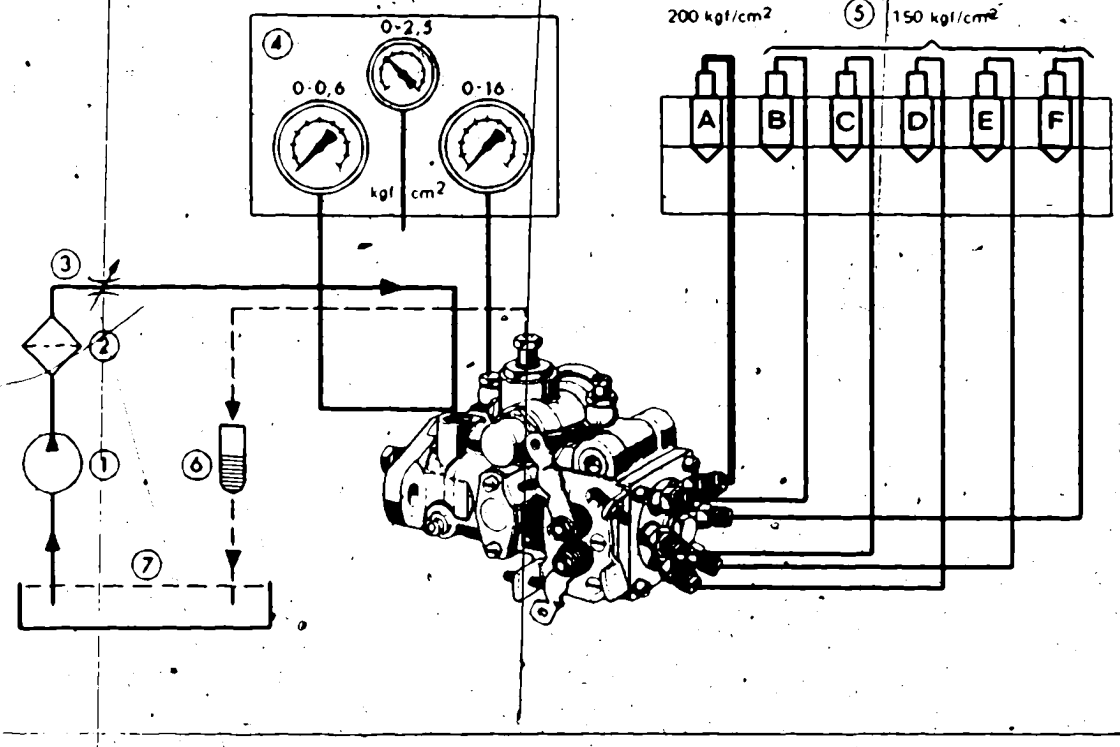
---

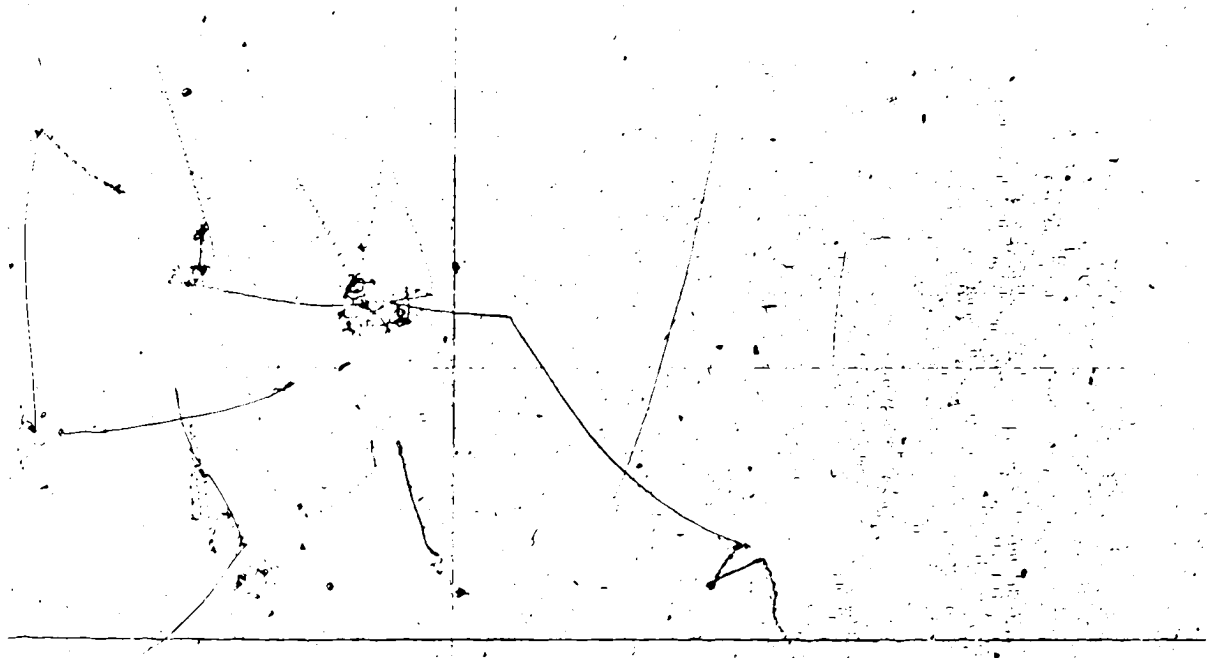
1. EQUIPO DE ENSAYO (véase también hoja de oferta)	Nº de pedido	Fórmula de tipo
1 escuadra de fijación	1 688 010 010	EFEP 157
1 brida intermedia (véase hoja de oferta)	1 688 720 . . .	EFEP 157
6 inyectores de ensayo	0 681 443 014	EFEP 182
6 portainyectores (150 kp/cm², 1 pieza 200 kp/cm²)	1 688 901 000	EF 8511/9 G
6 tuberías de presión (6 x 2 x 840), véase hoja de oferta	1 680 750 . . .	EFEP 198
1 dispositivo de ensayo (juego de manómetros con piezas de conexión)	1 688 130 075	EFEP 495 A
1 dispositivo de medición de la carrera del variador de avance (émbolo corto)	1 688 130 046	EFEP 459
1 dispositivo de medición de la carrera del variador de avance (émbolo largo)	—	KDEP 1000

El ensayo puede realizarse según VDT-WPP 161/1 SP — 1er suplemento, también en los bancos de pruebas

EFEP 5 con juego de accesorios	1 687 000 008	EFEP 491
EFEP 25 con juego de accesorios	1 687 000 009	EFEP 492

Pipe-line diagram
Schéma de canalisation
Esquema de conexión de tuberías





① = Fuel supply pump
② = Filter
③ = Supply pressure regulator
④ = Pressure gauge 0—0.6 kgf/cm² (8.5 psi) (feed pressure)
0—2.5 kgf/cm² (35.6 psi) (charge pressure)
0—16 kgf/cm² (228 psi) (supply pump pressure)

⑤ = Nozzle holders with nozzles
150 kgf/cm² (2130 psi)
Nozzle holder with nozzle
200 kgf/cm² (2840 psi)
on outlet A for start quantity
⑥ = Metering glass for overflow quantity
⑦ = Test oil tank

① = Pompe d'alimentation
② = Filtre
③ = Régulation de pression d'arrivée
④ = Manomètres 0—0,6 kgf/cm² (pression d'arrivée)
0—2,5 kgf/cm² (pression de charge)
0—16. kgf/cm² (pression de pompe d'alimentation)

⑤ = Porte-injecteur avec injecteurs 150 kgf/cm²
Porte-injecteur avec injecteur 200 kgf/cm²
au départ A pour débit de démarrage
⑥ = Jauge pour mesurer le débit de décharge
⑦ = Réservoir d'huile d'essai

① = Bomba de alimentación
② = Filtro
③ = Entrada de la regulación de presión
④ = Manómetro 0—0,6 kp/cm² (presión de entrada)
0—2,5 kp/cm² (presión de carga)
0—16 kp/cm² (presión de la bomba de alimentación)

⑤ = Portainyectores con inyectores 150 kp/cm²
Portainyector con inyector 200 kp/cm²
en la salida A para el caudal de arranque
⑥ = Vaso de medición para el caudal de rebose
⑦ = Depósito del aceite de ensayo

2. TEST CONDITIONS (see pipe-line diagram)

Test oil OI 81 v 11 is used for testing at a temperature of 40 ± 5° C (104 + 9° F) and a supply-pump inlet pressure of 0.2 kgf/cm² (2.8 psi) for all speeds.

The overflow is fed from the overflow valve into the test oil tank of the test stand using a plastic hose. To measure the overflow quantity it can be collected here in a measuring glass.

2.1 **The pressure gauge kit EFEP 495 A** is required for the following measurements:

Pressure gauge 0—0.6 kgf/cm² (0—8.5 psi) — for measuring the feed pressure — (check valve for protection of pressure gauge incorporated) is connected to the supply pump inlet.

Pressure gauge 0—16 kgf/cm² (0—228 psi) — for measuring the supply pump pressure — is connected to the supply pump outlet with a fitting.

Pressure gauge 0—2.5 kgf/cm² (0—35.8 psi) — for measuring the charge pressure (Section 8).

2.2 Initially bend the **high-pressure lines to nozzle holders** so that these can be connected without stress. It is advisable to mark the lines in accordance with the letters stamped on the distributor head and to connect them to the nozzle holders in the sequence A, B, C, etc., (see pipe-line diagram).

On some pump versions, it is necessary to set **one nozzle holder to 200 kgf/cm² (2840 psi)** and to connect it to **outlet A** for measuring the start quantity. This measurement is specifically stated on the appropriate test specification sheet.

2.3 **The timing-piston-travel gauge** is screwed in using an O-ring and the scale is then set to zero. Fit in accordance with direction of pump rotation:

with **clockwise rotation** — viewed from drive end — **on the left**
with **counter-clockwise rotation** — viewed from drive end — **on the right**

Note:

A new test specification sheet for distributor-type fuel injection pumps is used together with these instructions. The test sequence refers to the appropriate points.

The **check values** given separately (in brackets) on these test specification sheets require special attention.

BOSCH

Distributor-type fuel injection pump

TEST SPECIFICATIONS EP

VDT-WPP 001/4 B

Edition | Replacing

Special notes: Test instructions VDT-WPP 161/.. B
For pre-adjustment see overleaf

Nozzle	EFEP 182	Test oil	OI 61 v 11
Nozzle holder	EF 8511/9	Outside Germany	Calibration fluid B Shell
Opening pressure	150 kgf/cm² (2130 psi)	Test oil temperature	40 + 50° C (104 + 9⁰ F)
Fuel-injection tubing	6 x 2 x 840 mm	Feed pressure	0.2 kgf/cm² (2.8 psi)

Manufacturer:

Engine model:

All test specifications apply exclusively to BOSCH fuel injection pump test stands and BOSCH test equipment.

Pre-stroke setting mm

1. CALIBRATION OF PUMP

1.1 Timing piston travel
1.2 Supply pump pressure
1.3 Full-load quantity
1.4 Low idle
1.5 Start
1.6 Break-away

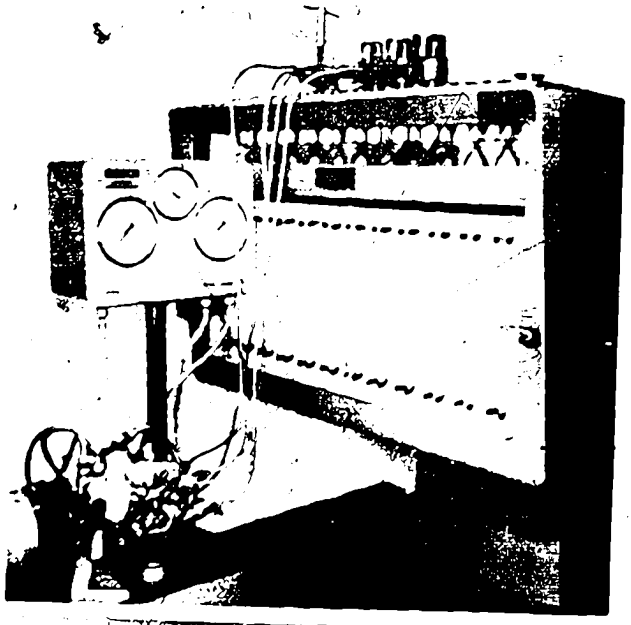
rev/min	mm kgf/cm² (psi) cm³/1000 strokes	Volume difference cm³

2. TEST SPECIFICATIONS and in brackets = (CHECK SPECIFICATIONS)

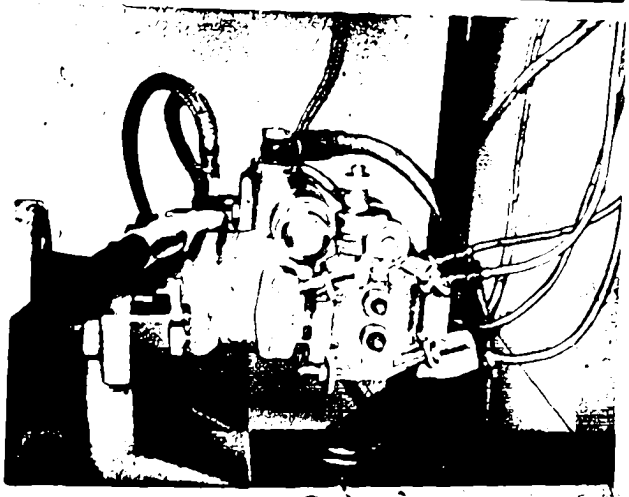
2.1 Timing device rev/min mm
2.2 Supply pump rev/min kgf/cm²
2.3 Delivery quantities

Speed control lever	Delivery-rate control lever	rev/min	cm³/1000 strokes	Overflow quantity cm³/10 sec
Max. speed stop	Full-load			
	Shut-off			
Idling stop	Full-load			

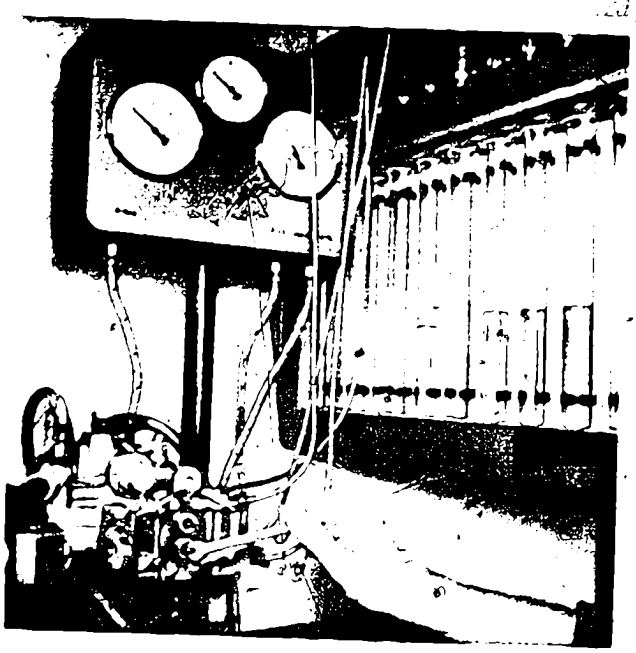
ROBERT BOSCH GMBH STUTTGART GERMANY



1



2



3

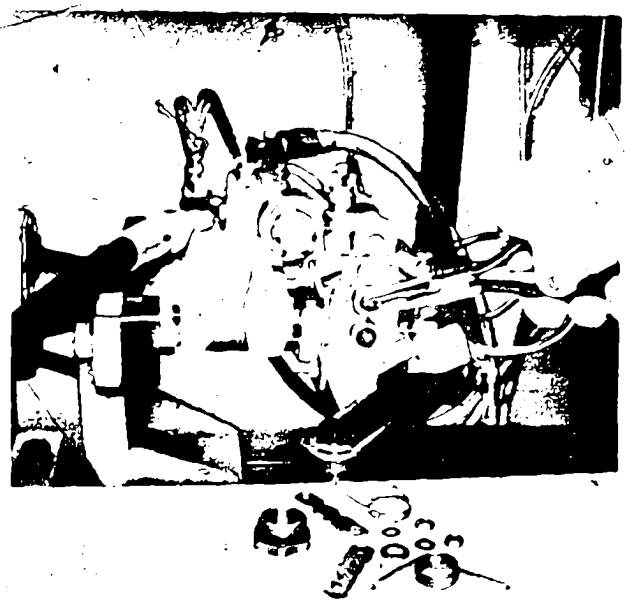
4. TEST PROCEDURE FOR NEW SETTING

4.1 Clamp pump (overflow valve at top).
Connect timing-piston-travel gauge and pressure gauge. Connect fuel supply and overflow hose as well as fuel delivery tubings with test nozzles rated 150 kgf/cm² (2130 psi), possibly one nozzle rated 200 kgf/cm² (2840 psi).

Open vent screws on nozzle holder and intermediate pump housing. Remove delivery rate and speed control levers. Allow pump to run at max. 100 rev/min and set feed pressure in accordance with test specification sheet. When bubble-free test oil flows out, close vent screw on intermediate housing.

4.2 Presetting of spill-piston shaft and throttle shaft (initial positions)
Stop plate (seen from pump drive end)
fitted on right = delivery-rate adjustment on lower shaft
fitted on left = delivery-rate adjustment on upper shaft

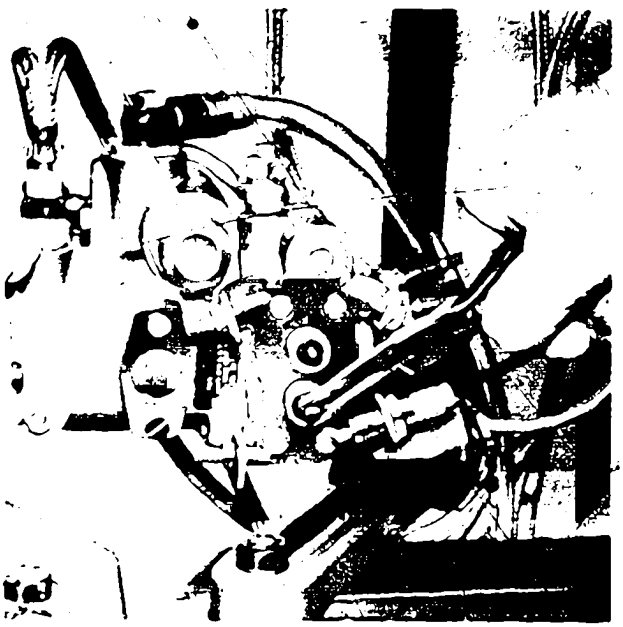
Set initial position of spill-piston shaft (approx. full-load position)
Turn top surface of spill-piston shaft square-head into horizontal position. Where present, the notch or driver slot in the spill piston points
downwards, if lever fitted on the right
upwards, if lever fitted on the left



Throttle shaft

Turn throttle shaft square-head in direction of higher break-away speed until delivery starts (approx. low idle).
If no delivery occurs, turn square-head of spill-piston shaft through 90° (new initial position).
Repeat presetting of throttle shaft.
Close vent screws on nozzle holders.

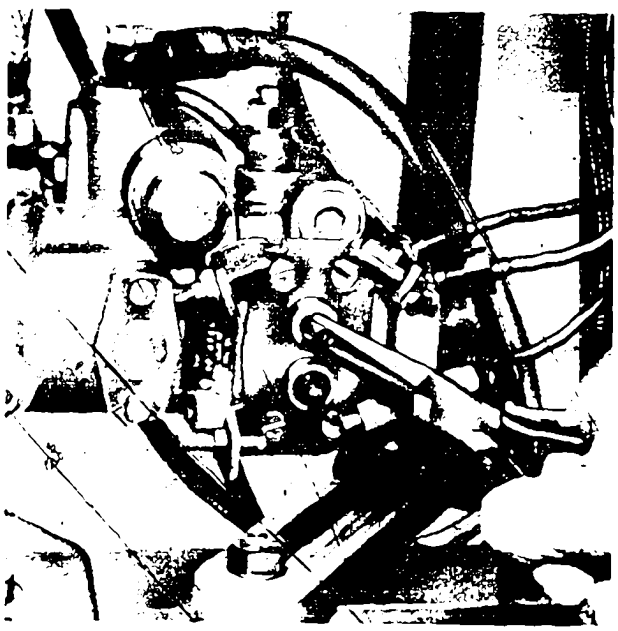
4



Starting check

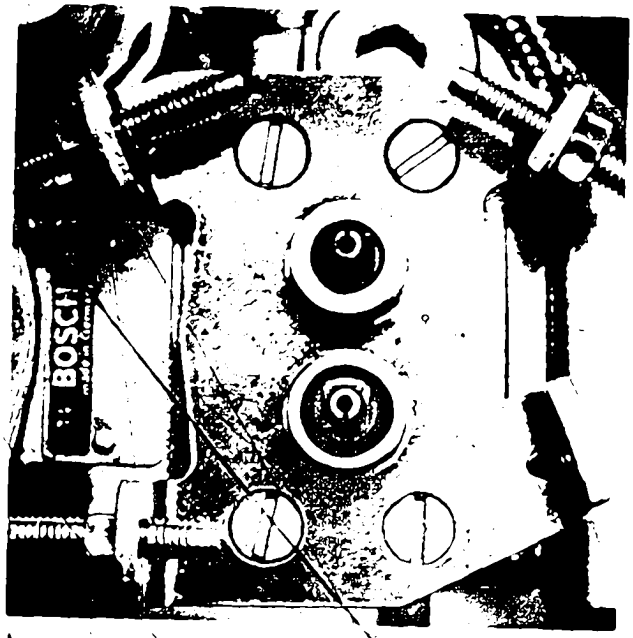
on pumps with mechanical start-quantity control:
Turn spill-piston shaft slowly in direction of less delivery until the start quantity begins to flow suddenly just before reaching the shut-off position.
Note: The start quantity will only flow if the throttle shaft is in the idling position.
If the start quantity should fail to flow, turn spill-piston shaft through 180° (new initial position).

5



Turn throttle shaft in direction of higher break-away speed which must reduce delivery or cut out completely.
Turn spill-piston shaft (horizontal) back (approximate full-load position).

6

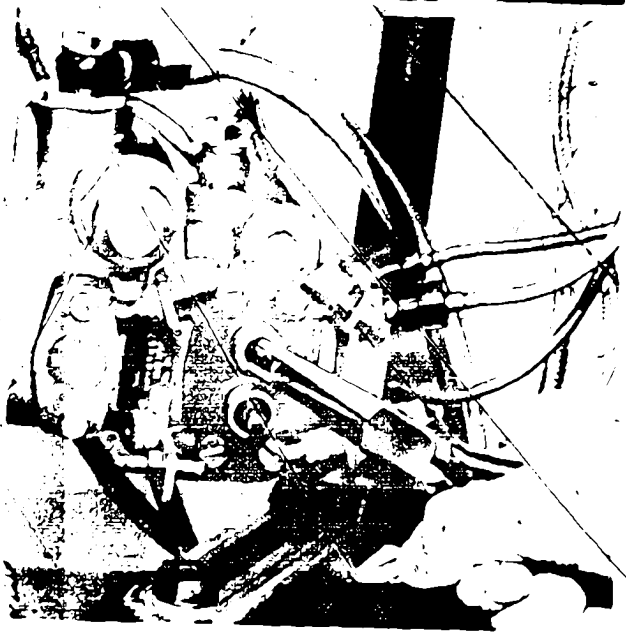


Starting check

on pumps with automatic start-quantity control.
Where present, the notch on the spill-piston shaft or the driver slot on the spill piston points

downwards, if lever fitted on the right,
upwards, if lever fitted on the left

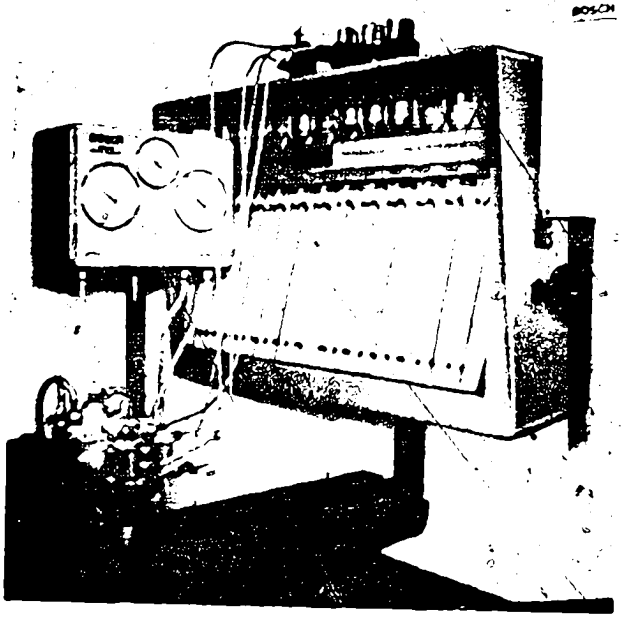
7



Select initial position of throttle shaft.

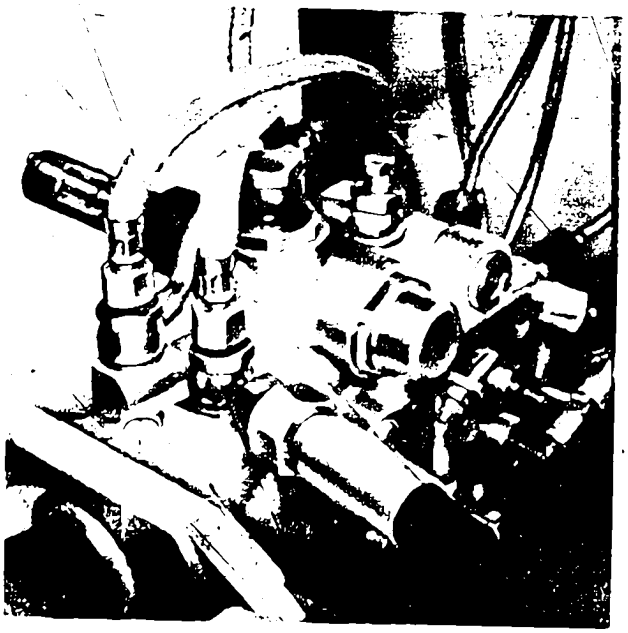
Run pump at highest speed — test specification sheet 2.3, highest value. Simultaneously turn throttle shaft square-head in direction of higher break-away speed; delivery should not cease due to this speed increase.
Turn throttle shaft square-head in direction of idling stop until the quantity delivered is reduced to approximately half

8



8.3 Running-in (only necessary after repair).
Prior to starting the test procedure, the pump should be run in for approximately 20 minutes. Full-load quantity and speed should be in accordance with the appropriate test specifications.

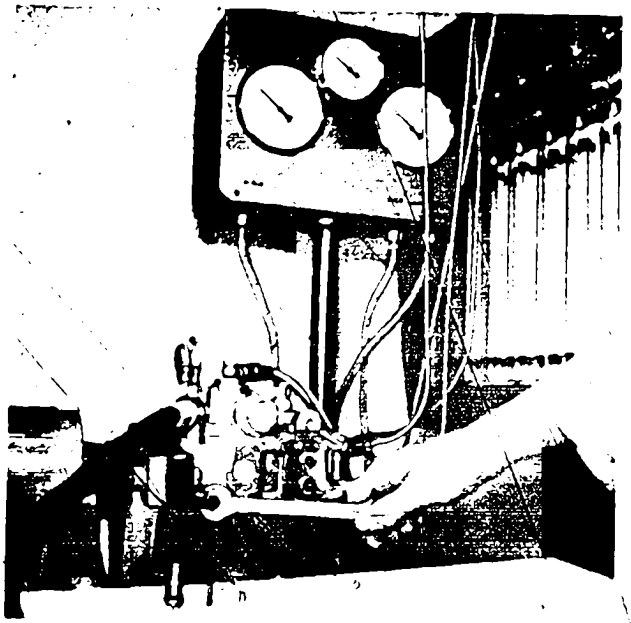
9



10

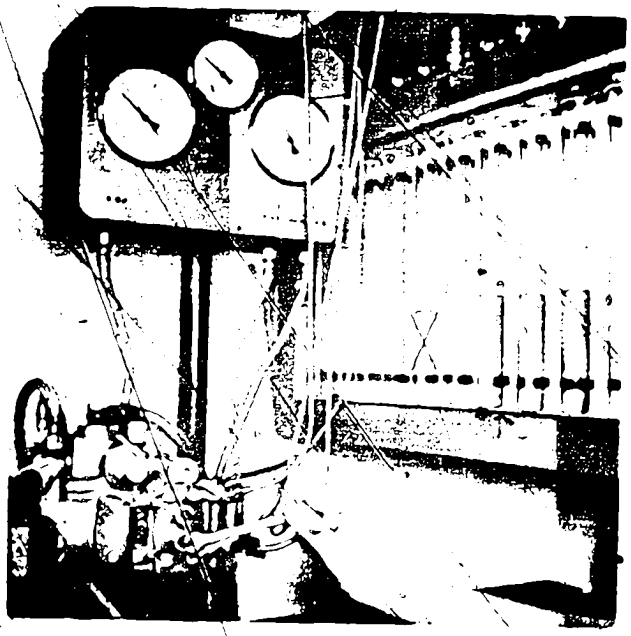
4.4 Adjust pump.
For calibration specifications see test specification sheet, Section 1.

Set **timing piston travel** and supply pump pressure.
The timing piston travel is influenced by the timing piston spring and by the pressure of the supply pump. The spring preload is measured and set beforehand in accordance with VDT-WJP 161 3 B. It must therefore be corrected with shims or the spring must be renewed. The pressure of the supply pump also influences the cut-in and cut-out point of the automatic excess starting fuel control.



11

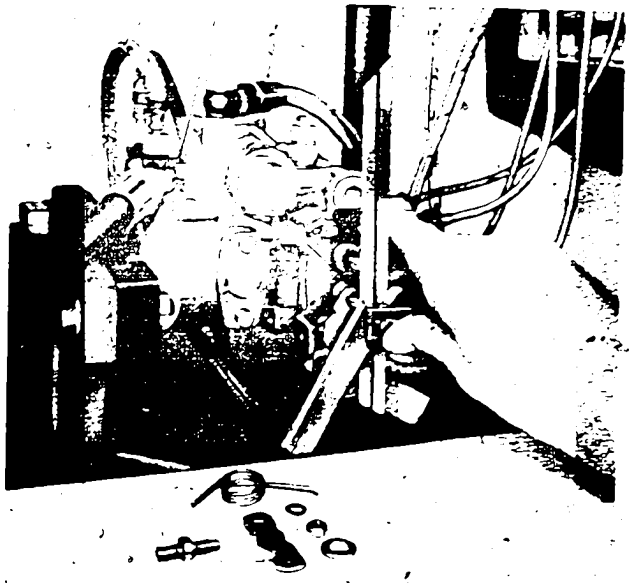
Increase **supply pump pressure** on pressure control valve by pushing the pressed-in plug inwards (for press-in tool, see Fig. 27) or exchange small plungers of varying length until either the supply pump pressure or the timing piston travel and ultimately both together have the prescribed setting values.
Test specification sheet 1.1 and 1.2



12

Set **full-load quantity** — test specification sheet 1.3 — on spill piston shaft square-head. (Do **not** read at 200 kgf/cm² [2840 psi] outlet!) Fit torsion spring and washer.

Select delivery-rate control lever.
Control levers with and without center punch mark differ in that the gearing is offset by half a tooth.



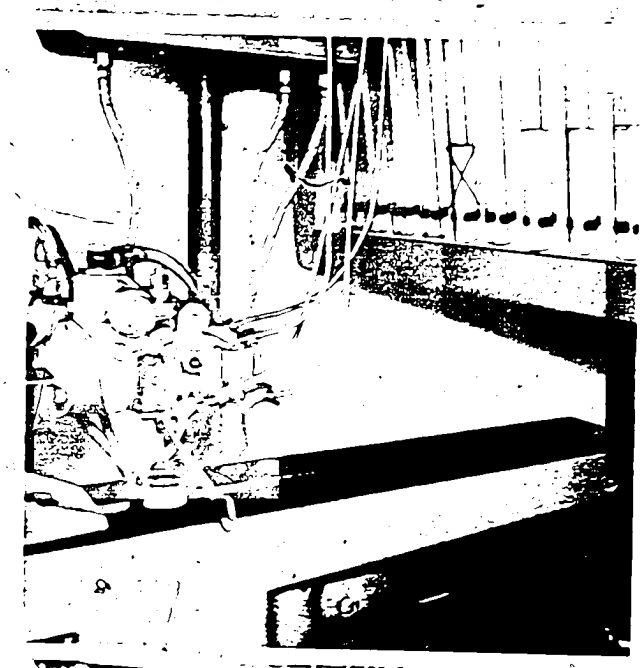
13

Fit delivery-rate control lever — angle γ

The angle γ is the deviation of the delivery-rate control lever relative to the vertical in the direction of the full-load stop

Fit delivery-rate control lever under angle γ in such a way that the spill-piston shaft is not rotated while fitting.

If the lever cannot be fitted in this position, use the other lever (center punch marking?).



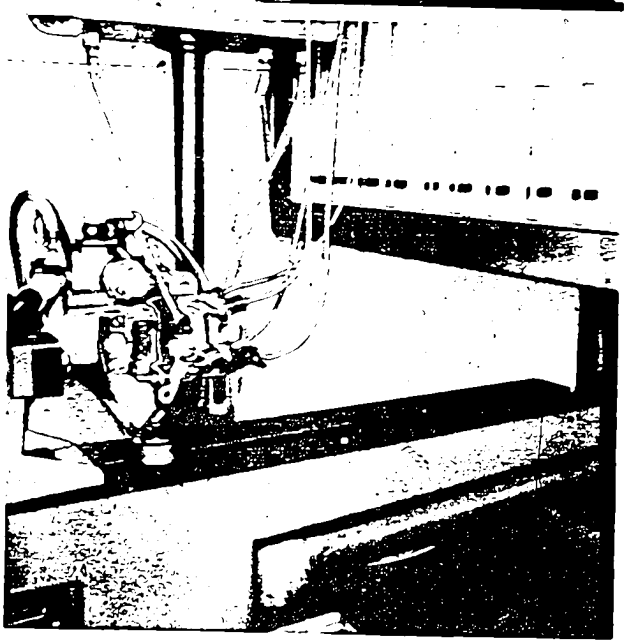
14

Bring full-load stop screw into contact with fitted delivery-rate control lever. Do not rotate spill-piston shaft while doing this! Fit spring washer and nut, and hook in the torsion spring

On pumps without spring-loaded start and shut-off stop, check whether the shut-off position can be reached by adjusting the delivery-rate control lever. If this is not the case, use the other lever (center punch marking?), make full use of angle tolerance

Delivery-rate control lever to full-load

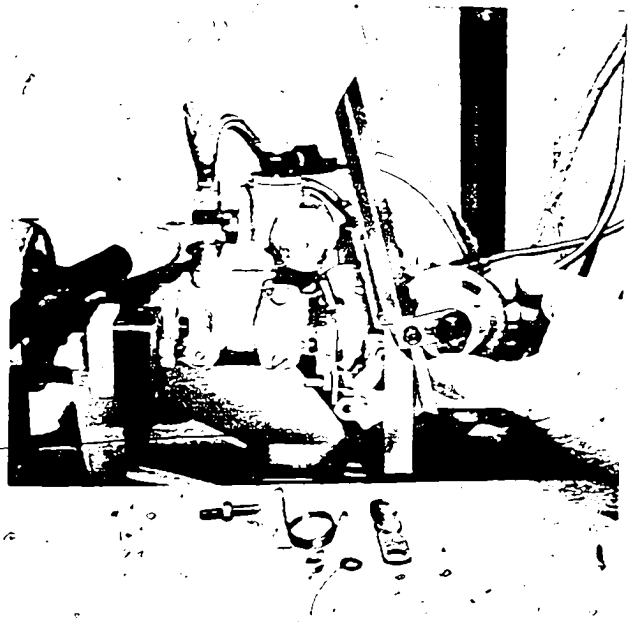
Correct full-load quantity on stop screw in accordance with test specification sheet 1.3 (do not read at outlet 200 kgf cm² [2840 psi])



15

Set low idle — test specification sheet 1.4.

Turn throttle shaft square-head in direction of lower break-away speed until the low-idle quantity is reached. During this adjustment delivery-rate control lever will be in contact with the full-load stop. Fit torsion spring



16

Select speed-control lever

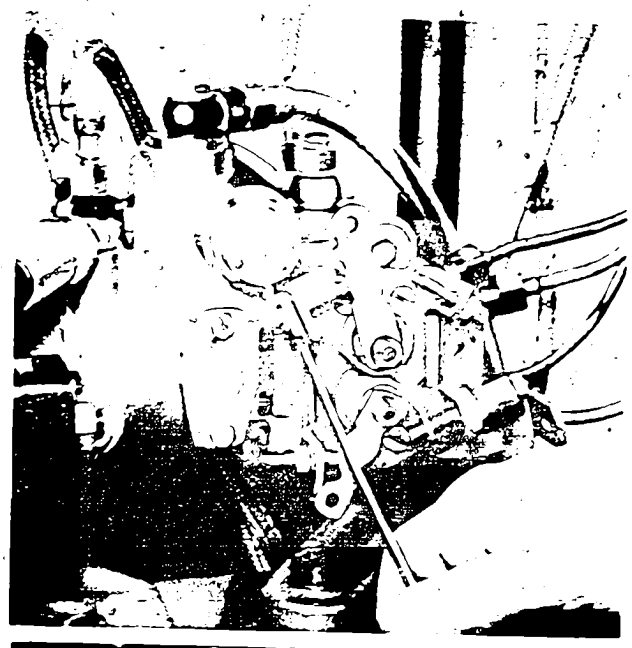
In addition to levers with and without center punch mark there are also speed control levers with flanged-on strap. On versions of this type, the strap can be adjusted relative to the lever by approx. half a tooth.

Fit speed control lever — angle α.

The angle α is the deviation of the speed control lever relative to the vertical in the direction of the idling stop.

Fit speed control lever under angle α in such a way that the throttle shaft is not rotated while doing this.

If the lever cannot be fitted in this position, use the other lever (center punch mark?) or modify position of strap relative to control lever.



17

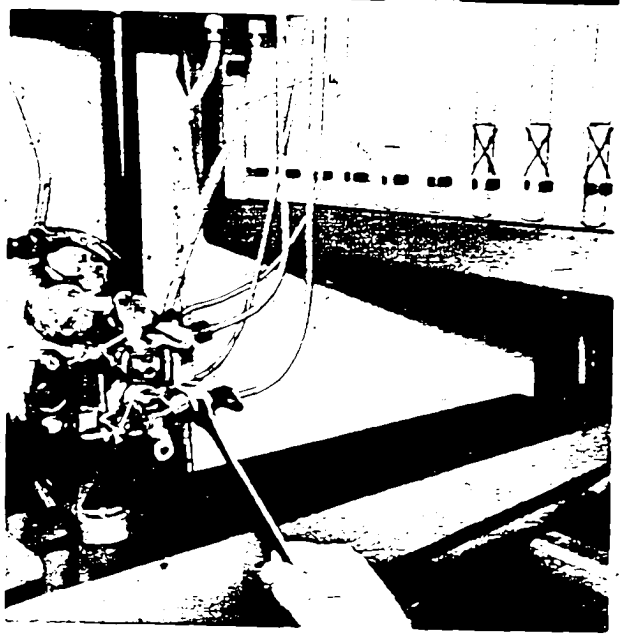
Bring idling stop screw into contact with fitted speed control lever. Do not rotate throttle shaft while doing this and then fit spring washer and nut.

Spring-loaded idling and shut-off stop — if provided, check 10° angle by overcoming spring pressure.

Low idle — test specification sheet 1.4.

Correct quantity on idling stop screw (do **not** read at 200 kgf/cm² [2840 psi] outlet).

The delivery-rate control lever should be in contact with the full load stop, the speed control lever with the idling stop which should not be compressed.



18

Set mechanical start-quantity control — test specification sheet 1.5.

Speed control lever in contact with idling stop.

Pull delivery-rate control lever in shut-off direction until just before reaching the shut-off position the start quantity cuts in suddenly.

Bring spring-loaded start and shut-off stop into contact with delivery-rate control lever (do not compress spring).

If necessary, correct start quantity — **but only read at 200 kgf/cm² (2840 psi) outlet.**

Check shut-off and start shut-off angle of 10° by overcoming spring pressure.

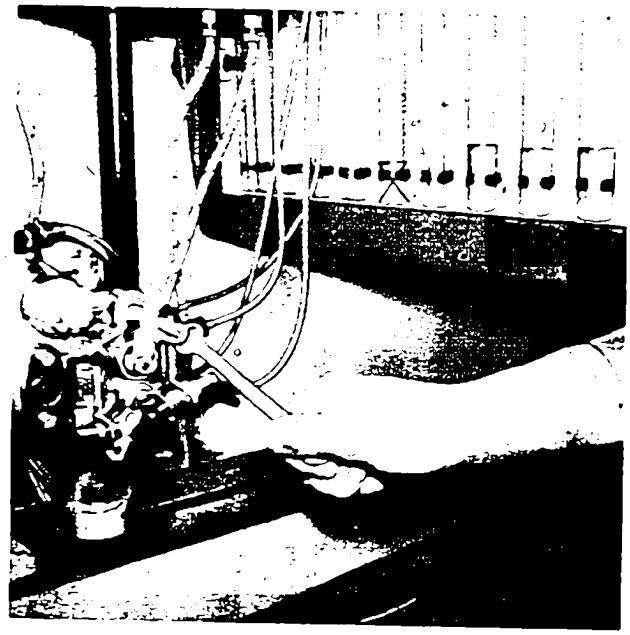
Set automatic start-quantity control — test specification sheet 1.5.

The supply-pump pressure influences the cut-in and cut-out point of the automatic start-quantity control.

If correction should be necessary, it is essential to observe the tolerance band of supply pump pressure and timing-piston travel.

The angle δ is the overall deflection of the delivery-rate control lever (full-load to shut-off).

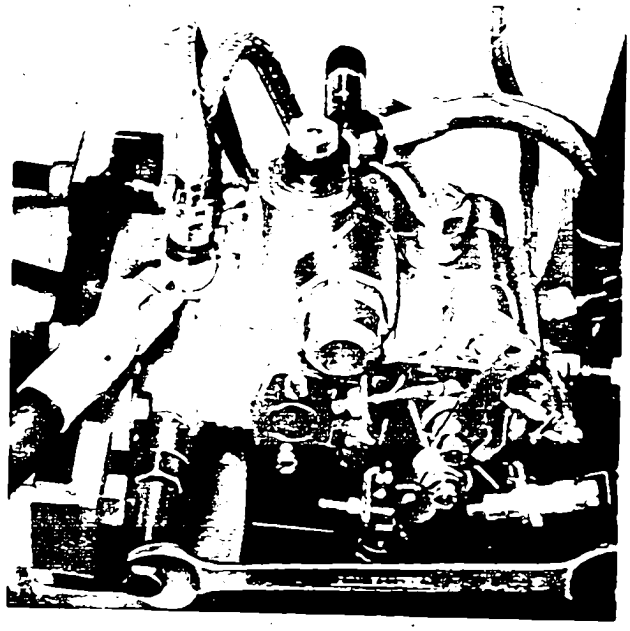
C2



19

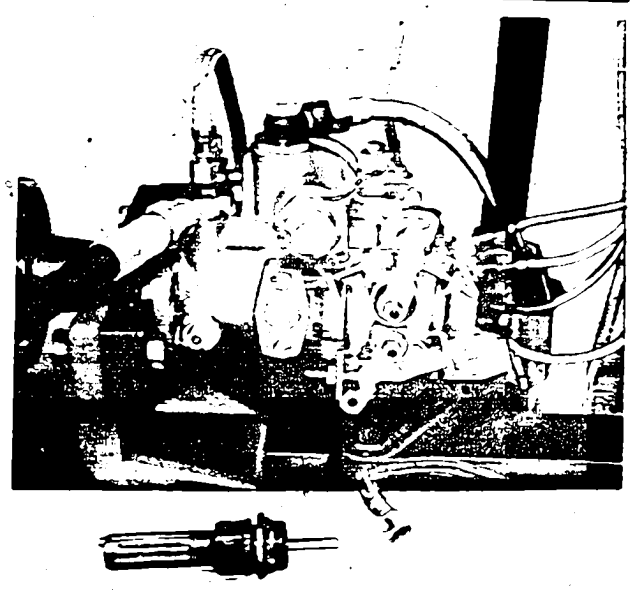
Set break-away ← test specification sheet 1.6
Turn speed control lever in direction of higher break-away speed until full delivery starts
Turn speed control lever in idling direction until delivery quantity is in accordance with test specifications.
Bring stop screw into contact with control lever.
Correct delivery quantity on stop screw in accordance with test specification sheet. (Do **not** read at 200 kgf/cm² [2840 psi] outlet.)
Delivery-rate control lever in full-load position, speed control lever in contact with maximum speed stop.

The angle β is the overall deflection of the speed control lever (idling speed — maximum speed).



20

4.5 Check pump
Test specifications section 2 — values not in brackets.
Delivery-rate control lever in full-load position, speed control lever in contact with maximum speed stop.
Timing-piston travel — test specification sheet 2.1
Supply pump pressure — test specification sheet 2.2
Check the above and correct within tolerances.

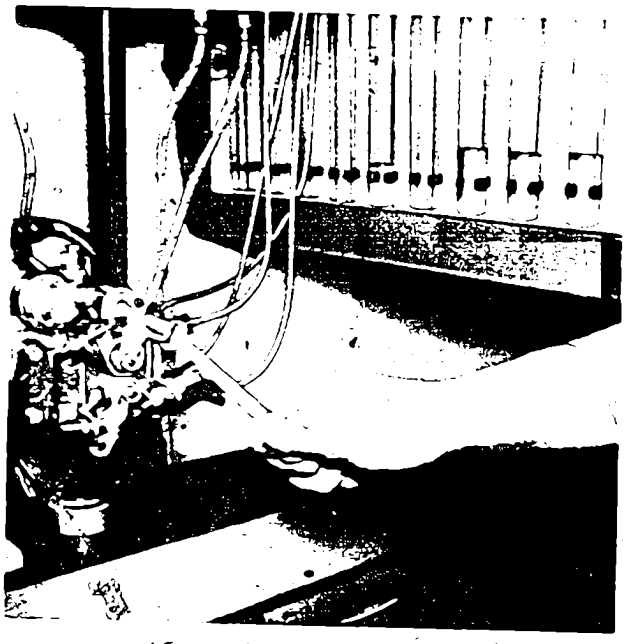


21

Remove timing-piston travel gauge and pressure gauge for supply-pump pressure.

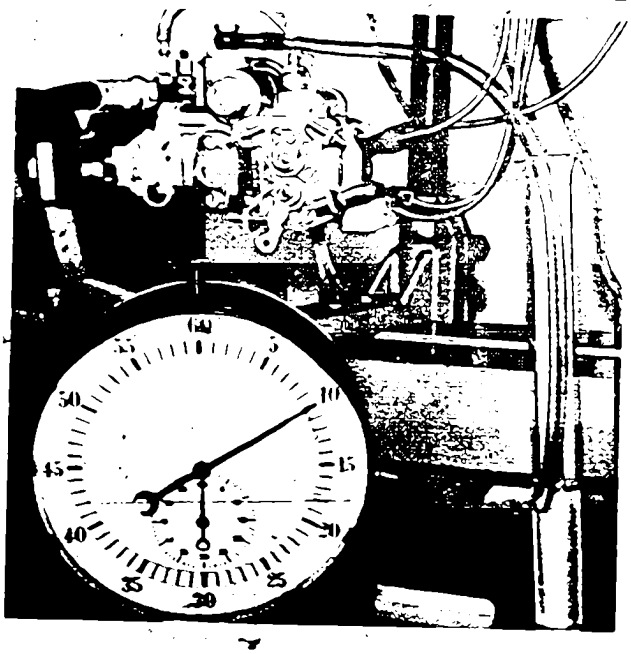
22

C3



22

Delivery quantities — test specification sheet 2.3
Check values not in brackets and correct if necessary.
Do **not** read at 200 kgf/cm² (2840 psi) outlet when checking full-load and partial-load quantities.
Start quantities — if stated in the test specification sheet — should **only be read at the 200 kgf/cm² (2840 psi) outlet.**

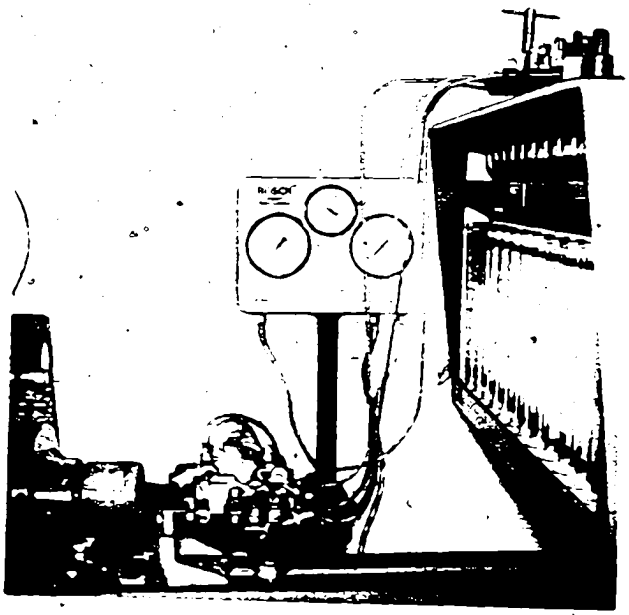


23

Check overflow quantity — test specification sheet 2.3.
If the measured quantities lie outside the test specifications, the pump may, for example, have internal leakages or the overflow valve, pressure equalizer, etc., may be defective.

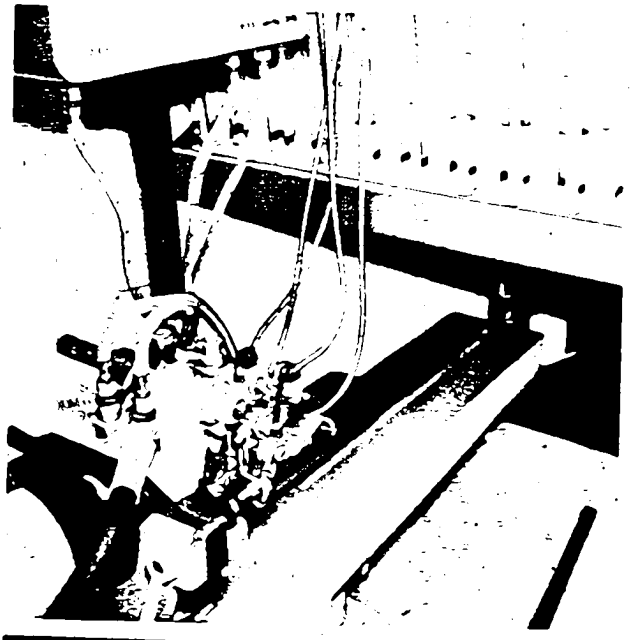
5. CHECKING

5.1 Clamp pump into position — with overflow valve at top.
Check pre-stroke and pointer setting — see VDT-WJP or VDT-WEP.



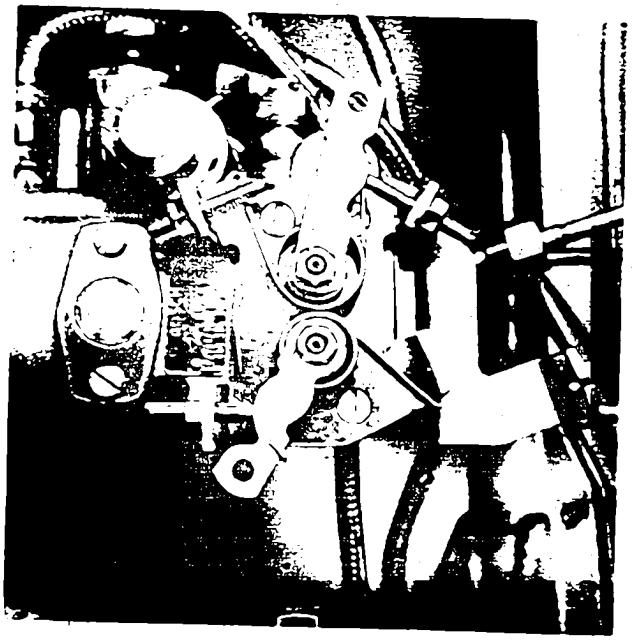
24

Connect timing-piston-travel gauge and pressure gauge.
Connect fuel supply and overflow as well as fuel injection tubings and test nozzles.
Open vent screws on nozzle holder and intermediate housing.
Allow pump to run with max. 100 rev/min and set feed pressure to 0.2 kgf/cm².
Close vent screws as soon as bubble-free test oil flows out.



25

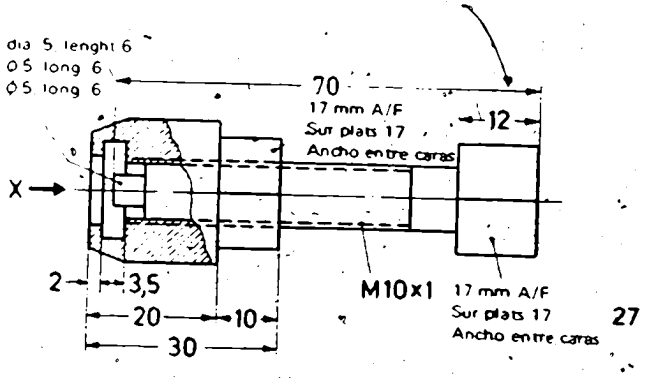
5.2 Check timing device and supply pump pressure
Timing device check specifications — test specification sheet 2.1 and
supply pump check specifications — test specification sheet 2.2.
only check values in brackets and record



26

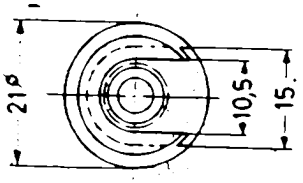
5.3 Check delivery quantities.
Delivery quantity check specifications — test specification sheet 2.3.

only check values in brackets and record.
After study of recorded values decide whether setting can be corrected or whether any repair work including readjustment is necessary.



27

Setting tool for pressure control valve (home made)

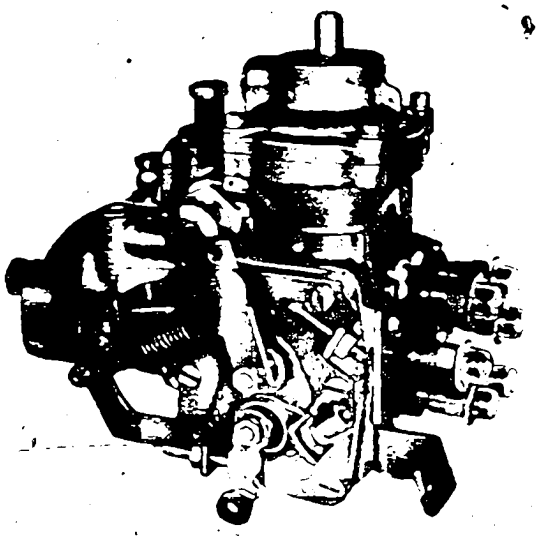


View X
Vue dans le sens de la flèche
Vista según X

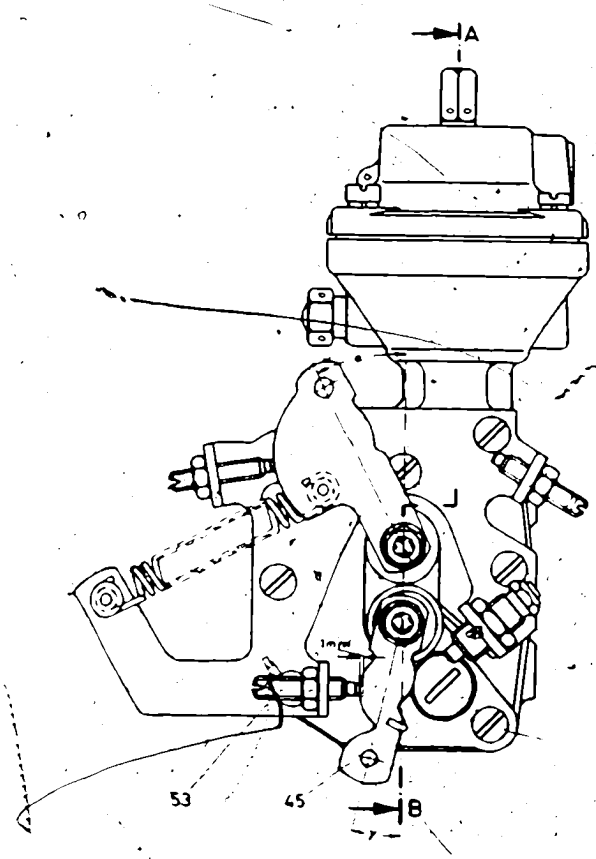
6. INTAKE-MANIFOLD PRESSURE-COMPENSATOR

(charge-pressure-responsive full-load stop)

Setting



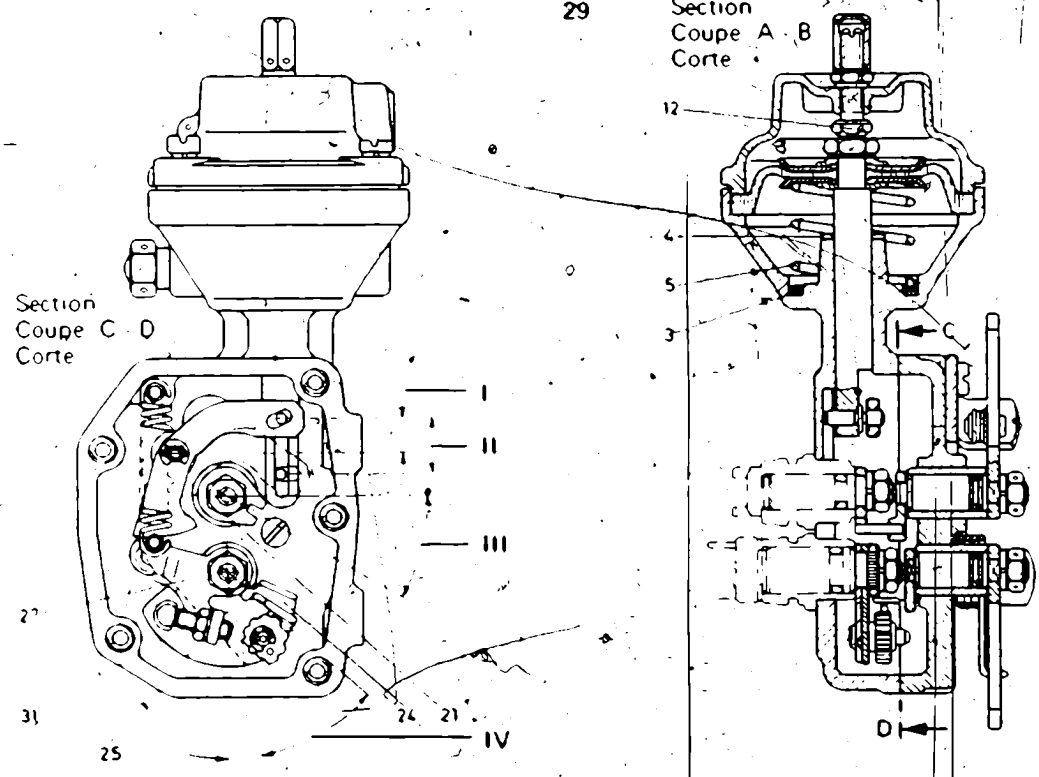
28



6. BUTEE DE PLEINE CHARGE TRAVAILLANT SUIVANT LA PRESSION DE LA CHARGE

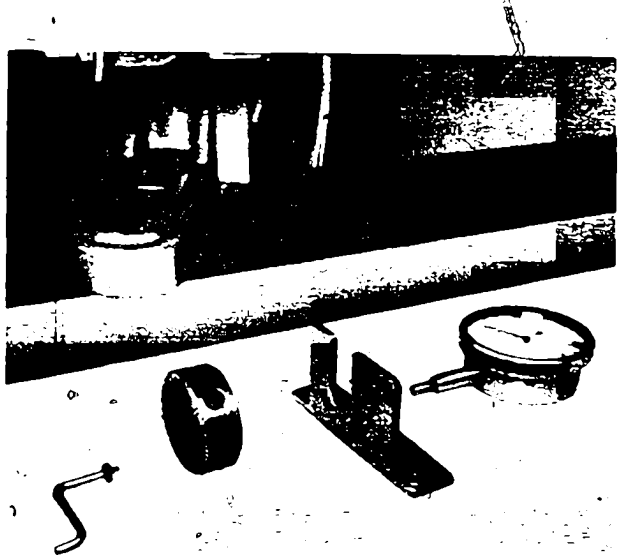
(limiteur de fumée)
Regler cette butée

6. AJUSTAR EL TOPE DE PLENA CARGA DEPENDIENTE DE LA PRESION DE CARGA (limitador de humos)



I	II	III	IV
Basic setting dimension with 0 charge pressure	Displacement travel at maximum charge pressure	Idling position, part 21	Fitting range for driver on delivery rate control lever
Cote de réglage de base pour pression de charge nulle	Course de réglage pour pression de charge maximum	Position de ralenti pièce 21	Plage de montage pour l'entraîneur du levier des débits
Cota de ajuste básico con presión de carga 0	Carrera de regulación con presión de carga máx.	Posición de ralentí (pieza 21)	Margen de montaje para el arrastrador en la palanca del caudal

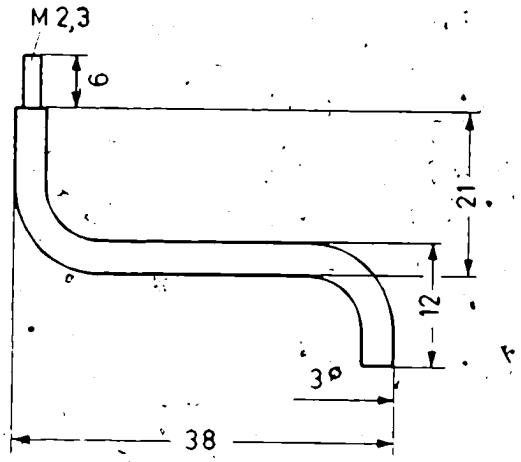
C7



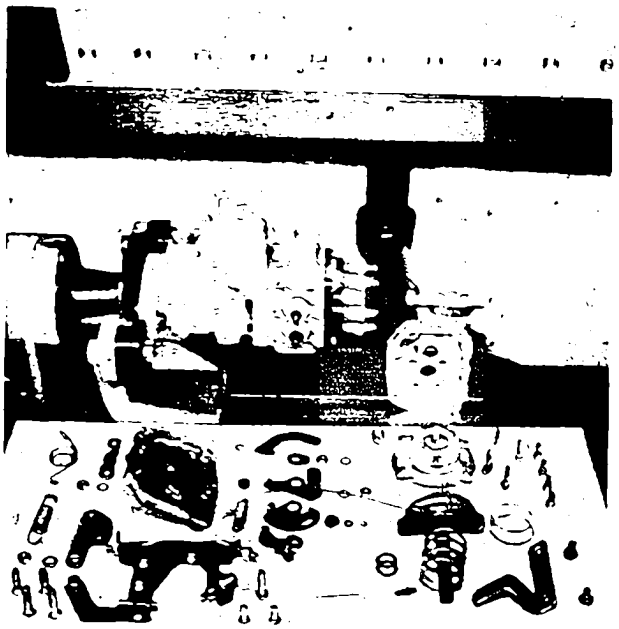
30

Additional components: to make the basic setting of the charge pressure-responsive full-load stop, use either commercially available vernier height gauge or test tools for gasoline injection pumps (Fig. 33, 35—37).

When using the gasoline injection pump tools mentioned above, make a measuring foot as shown in Fig. 31.

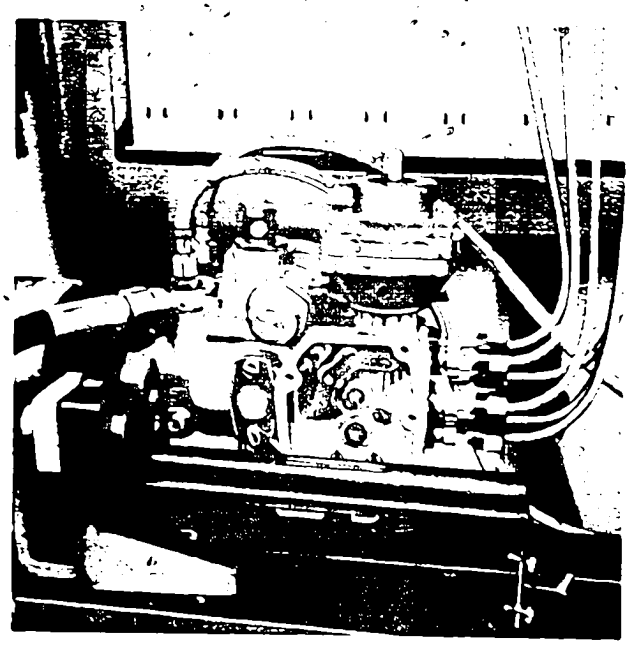


31



32

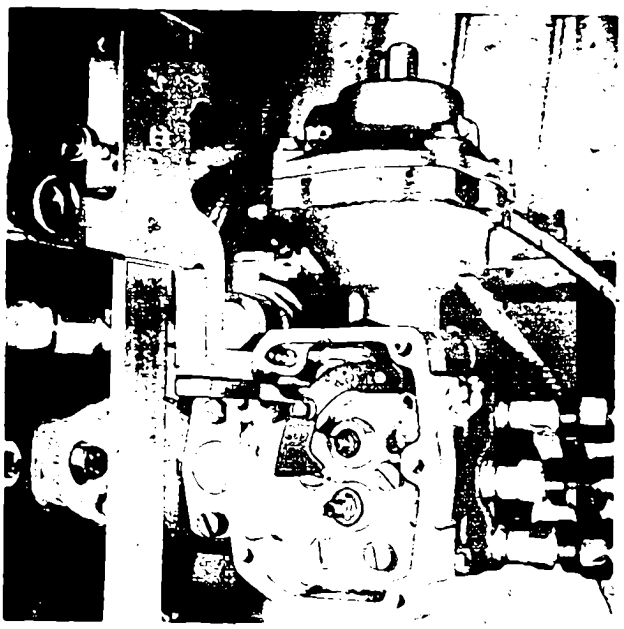
6.1 Mount manifold-pressure compensator housing, diaphragm assembly components and cam lever.



33

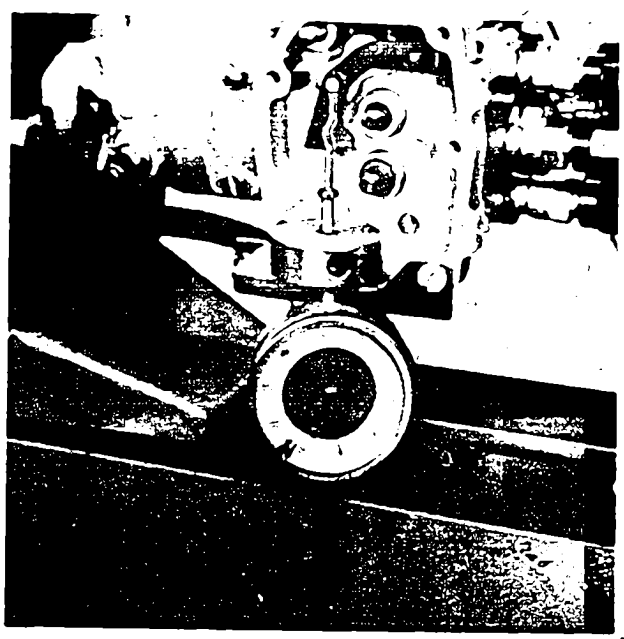
6.2 Connect lines and check in accordance with sections 4.1—4.2.

Fit support plate EFEP 455/0/1 horizontally.



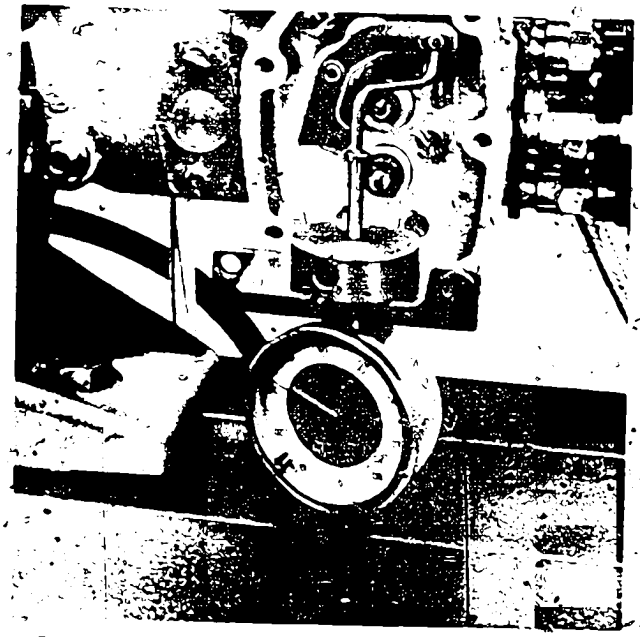
34

Instead of the gasoline injection pump test tools enumerated here, it is also possible to use a commercially available vernier height gauge.



35

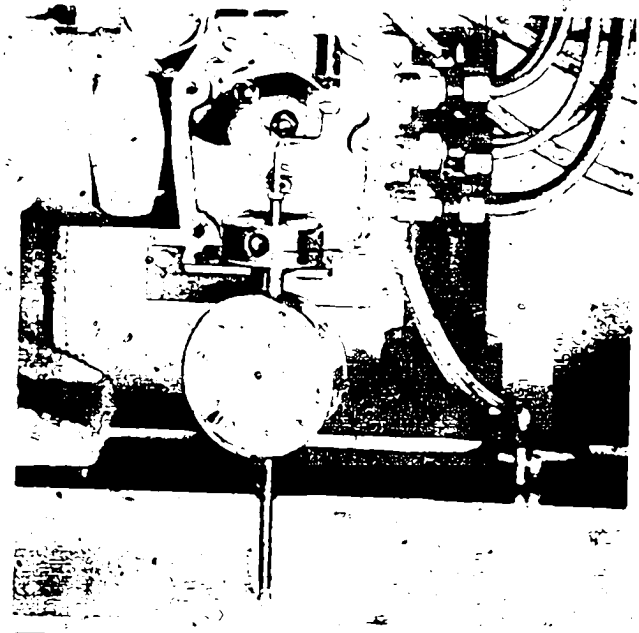
Fit dial indicator EFAW 63 with holder EFEP 414/2 and measuring foot as shown in Fig. 31.
Bring measuring foot into contact with bearing pivot on cam plate. Preload dial indicator to basic setting dimension with 0 charge pressure (e. g. 11.5 mm).



36

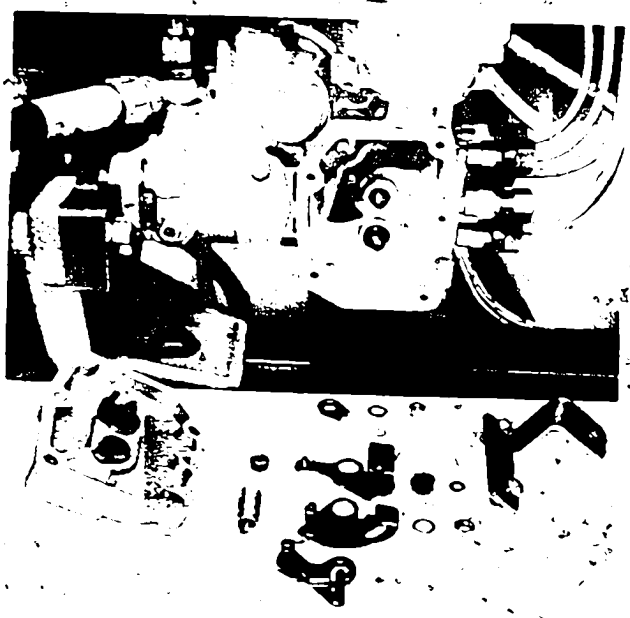
Reposition measuring assembly, bring foot into contact with adjusting pin. The dial indicator should show 0, correct with screw, Item 12 Fig 29 and secure with lock nut

Note the items appearing in the subsequent text are shown in Fig 29.



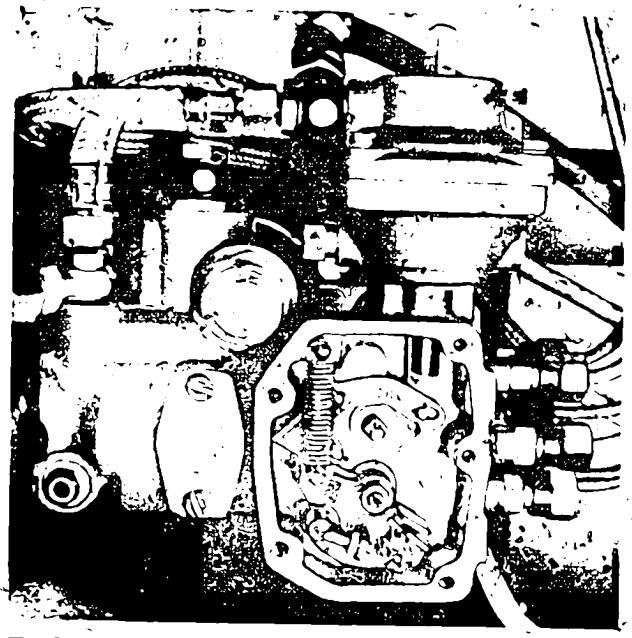
37

Connect compressed air supply with inlet union EFEP 179 2 and inlet union screw as well as 0—2.5 kgf/cm² (0—35.6 psi) pressure gauge to diaphragm housing.
Check displacement travel under maximum charge pressure (e.g. 16 mm). Correct with shims, Item 4.
Set spring preload (displacement start and end) by means of shims, Item 3.



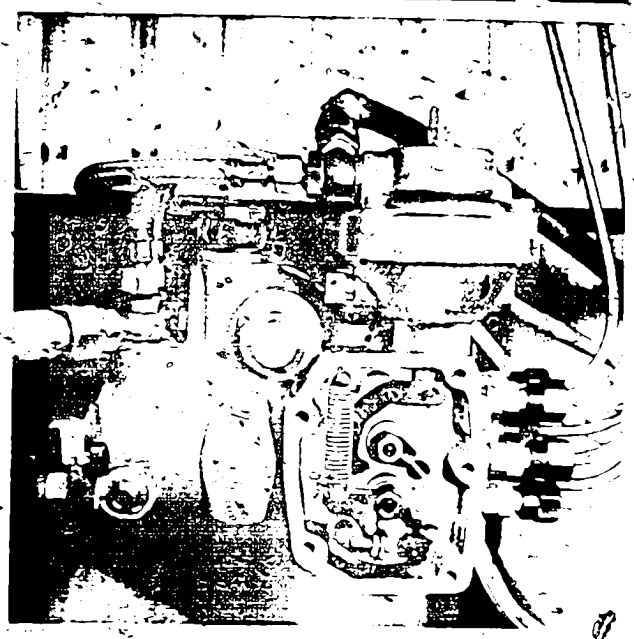
38

Fit internal delivery-rate control levers.
Insert items 24, 25, 27 with roller and ratchet plate as well as spacer and lock washer, hook tension spring into position.
Note fitting range for driver on delivery-rate control lever. The fitting range is in the direction of shut-off relative to the vertical (e.g. 10—50°).



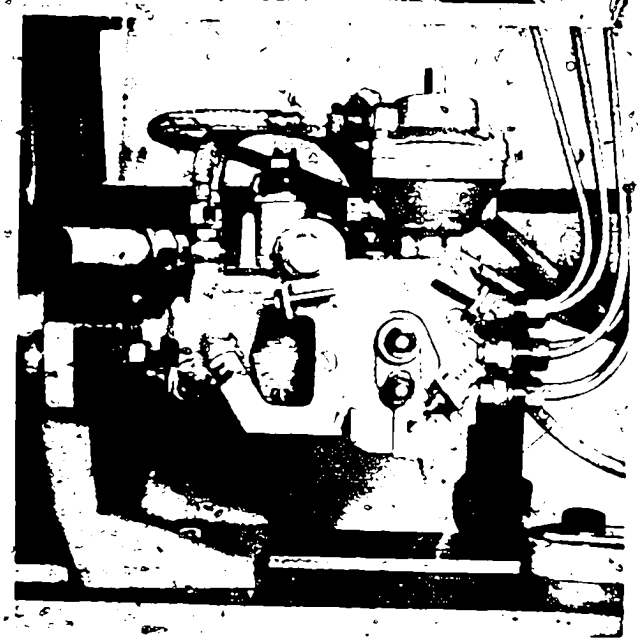
39

Correct full-load quantities (with charge pressure) according to test specification sheet by means of setting screw, item 31. Ratchet plate in center position during this adjustment.



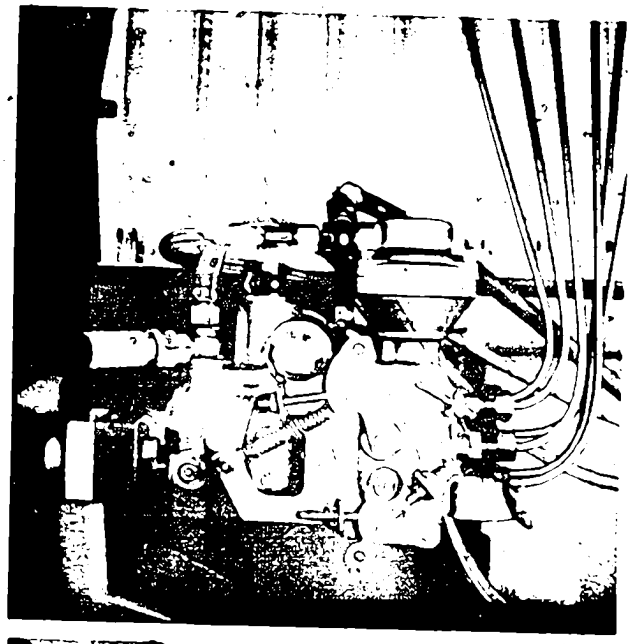
40

Set low idle on throttle-shaft square-head.
Fit driver, item 21, at an angle to suit idling position (e.g. 0—15°).
The idling position angle is the deviation of the driver slot towards bottom right relative to the horizontal.



41

6.3 Fit cover with stop plate:
Here, the driver of the outer throttle shaft must engage in the slot of the inner driver and the driver of the outer spill-piston shaft must be in contact with strap, item 24.



42

Fit external control levers.

Fit speed control lever (center punch marking?) at angle (in idling position and bring into contact with idling stop screw.

Correct low idle with stop screw in accordance with test specification sheet 1 4.

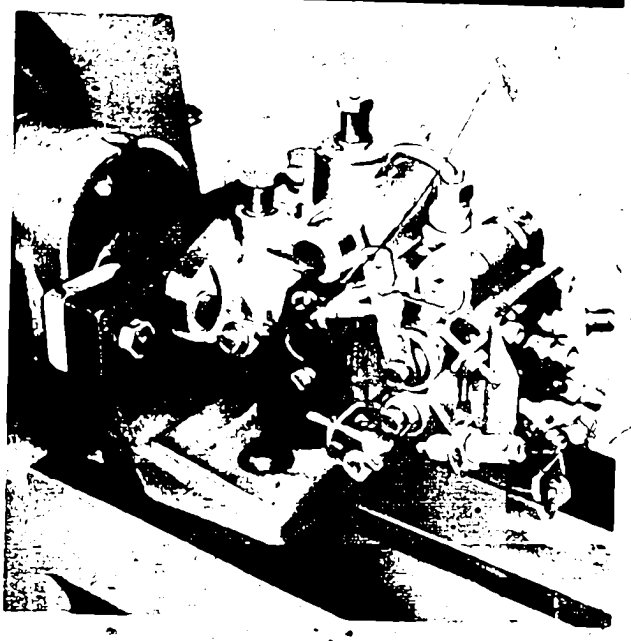
Set break-away on stop screw in accordance with test specification sheet 1 6.

Bring outer spill-piston shaft into contact with inner stop (of shut-off). — Set maximum charge pressure.

Fit delivery rate control lever (center punch marking?) at angle .

Set external stop screw to 1 mm clearance relative to delivery-rate control lever with torsion spring unhooked. Hook torsion spring into position.

Adjust start and shut-off stop, see Fig. 29.



43

7. FINAL OPERATIONS

Unclamp pump: Secure delivery-valve holder when releasing fuel-injection tubings to ensure that the delivery-valve holder does not slacken (do not exceed 4—4.5 kgf/m (tightening torque).

Sealing: All screw plugs should be sealed with sealing lacquer. Stop screws on stop plate should be either sealed with lacquer or with wire and lead seals whenever service work is carried out.

Kundendienst KH

Technische Mitteilung

Measuring device for 0 460..-EP/VA..C..
Distributor-type fuel injection pump

VDT-BMP 160/1002 B
Edition 3.1974
Translation of German
edition of 27.2.1874

To: AV/S

For functional reasons the timing device piston has been modified. An intermediate flange between the fuel injection pump and the measuring device is necessary so that the measuring device 1 688 130 121 (formerly KDEP 1025) can continue to be used for measuring the timing device travel. This intermediate flange can be manufactured locally according to Fig. 1 or ordered from your local representative. The Part Number will be announced in "WA-Information"

2 screws M 6 x 35 mm (2 910 141 207) are required for fastening. Also the seal ring 1 460 206 007 is needed for sealing between the measuring device and the intermediate flange. In future the measuring device 1 688 130 121 will be delivered complete with intermediate flange.

In case of inquiry, please contact your outhorized representative.

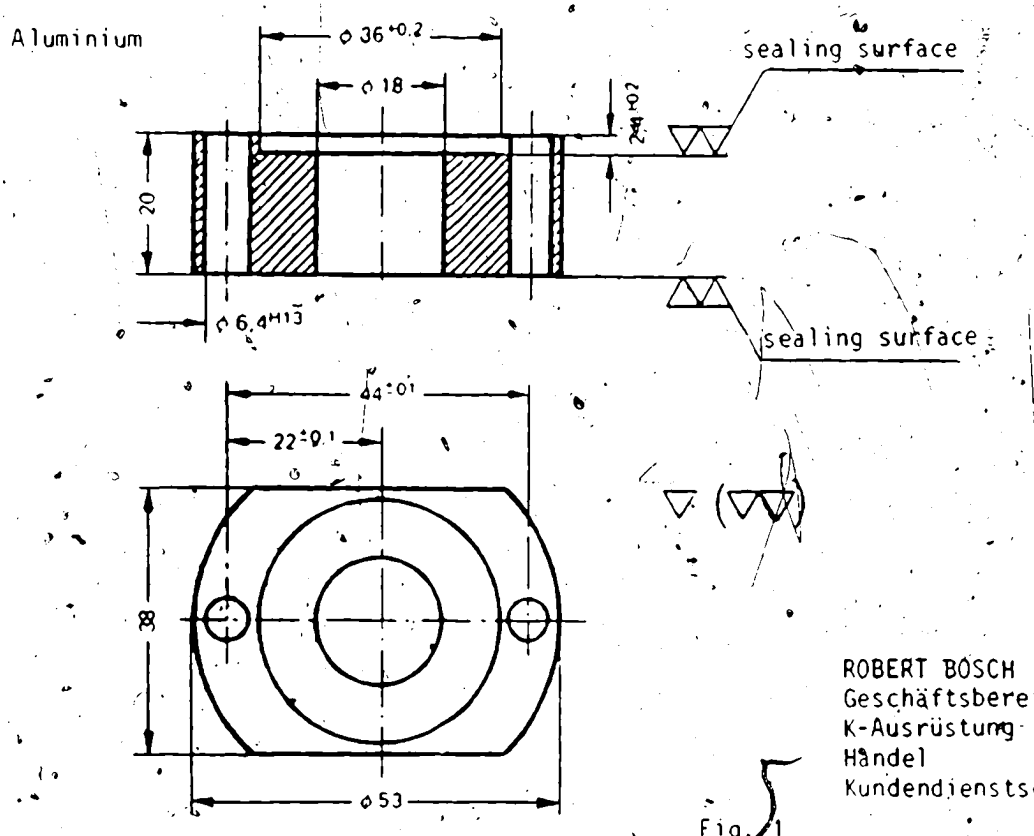


Fig. 1

ROBERT BOSCH
Geschäftsbereich
K-Ausrüstung
Handel
Kundendienstschule

BOSCH
Geschäftsbereich KH Kundendienst Kfz Ausrüstung
by Robert Bosch GmbH D 7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

DISTRIBUTOR-TYPE FUEL-INJECTION PUMP

VA.. 0 460 3..

VDT-I-460/113 En
11.1979

Change in gasket for delivery-valve assembly

As from FD 930, all distributor-type fuel-injection pumps type VA..C.. will be equipped with bronze gaskets 1 460 105 302 (Item 83 in the Service Parts List) instead of the copper gaskets used previously.

For all distributor-type fuel-injection pumps type VA..C.. with bronze gaskets, the tightening torque of the delivery-valve holder is increased from 35 ... 45 Nm to 45 ... 55 Nm.

Bronze gaskets can be fitted during repairs on VA..C.. distributor pumps having an older FD.

It is to be noted that only gaskets of the same material are to be used on the same hydraulic head. The delivery-valve holders must be tightened with the appropriate torque.

Note

The copper gaskets will continue to be fitted on distributor pumps type VA.. up to and including the B-version, and the tightening torque of 35 ... 45 Nm will be retained for the delivery-valve holder.

BOSCH
Geschäftsbereich KH Kundendienst Elt Ausrüstung
© by Robert Bosch GmbH D-7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

EP/VA..C.. 0 460 3..

List of service parts for

automatic excess-fuel starting device

VDT-I-460/118 En

6.1980

Designation	Pump model	Part number	Dimension group	Diameter
Sealing plug	All models	1 463 218 015	Normal	7,025-0,005
		016		7,031- "
		017		7,037- "
		018	Overdimension	7,125- "
		019		7,131- "
		020		7,137- "
Slotted spring pin	All models	1 460 310 001		
Helical spring B	EP/VA 3...193 EP/VA 4...136, 136-1, 136-2, 144, 164, 175, 176, 177 EP/VA 6...124, 124-3, 124-4, 124-5, 181, 181-1, 181-2, 181-3, 181-4, 182, 185, 185-1, 185-2, 201	1 464 626 018		
Helical spring	EP/VA 2...156, 162 EP/VA 3...134-2, 134-3, 134-4, 143, 152, 172 EP/VA 4...118, 118-1, 118-2, 118-3, 118-4, 141, 141-1, 141-5, 141-8, 145-1, 165, 170, 173, 175, 183, 186, 186-1, 197, 197-1 EP/VA 6...119, 119-1, 151, 151-1, 151-2, 153, 160, 160-1, 166, 167, 168, 168-1, 169, 178, 178-1, 186-1	1 464 626 019		

BOSCH

Geschäftsbereich KH Kundendienst Ausrüstung
© by Robert Bosch GmbH D-7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

C15

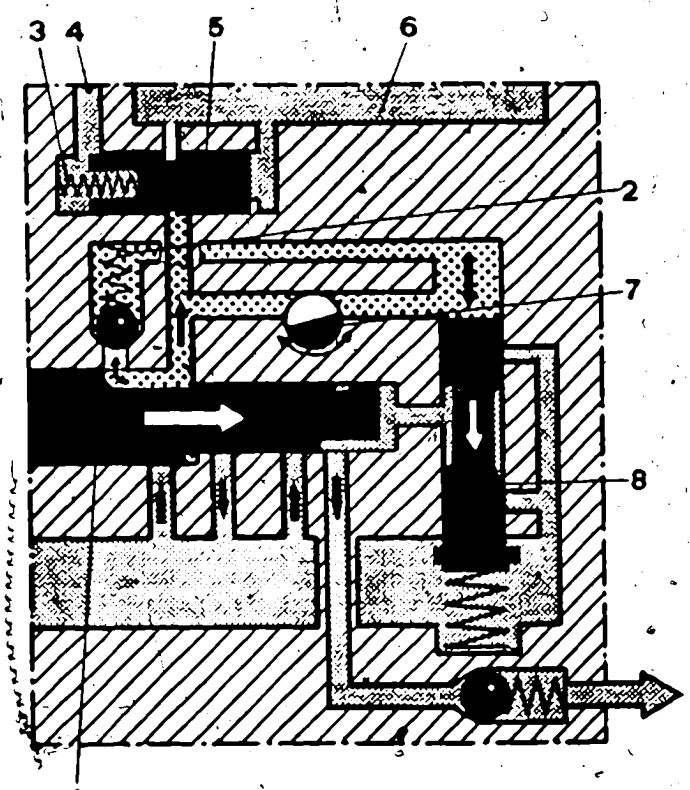
Designation	Pump model	Part number
Helical spring	EP/VA 6...150, 179	1 464 626 021
Helical spring	EP/VA 4...128, 141-3, 141-7, 171	1 464 626 022
Helical spring	EP/VA 4...180-4, 187, 188, 188-1, 190 EP/VA 6...180, 180-1, 180-2, 180-3, 189, 191, 191-1, 195, 196, 198, 199, 401, 402, 403	1 464 626 045

THROTTLE-CONTROLLED STARTING FUEL DELIVERY

Distributor-type fuel-injection pump
EP/VA.. C.. 0 460 3..

12.1981

Functional description:
In VA pumps with normal automatic starting fuel delivery the fuel of the control circuit is pumped directly to the pump interior (6) via the starting valve (5).

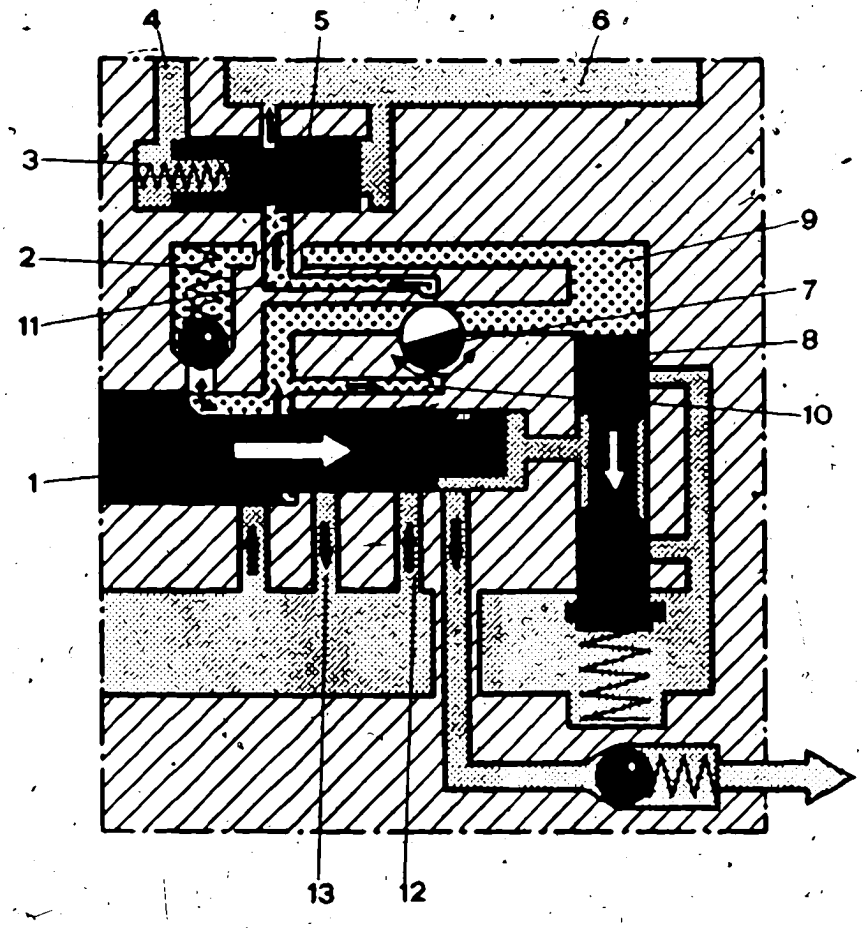


1 = Distributor-pump plunger
2 = Non-return valve
3 = Starting spring
4 = Suction side of supply pump
5 = Starting valve
6 = Pump interior
7 = Control throttle
8 = Control collar

BOSCH
Printed in the Federal Republic of Germany

C17

In the case of pumps with throttle-controlled starting fuel delivery the fuel flows via an additional bore (10) via the control throttle (7) to the starting valve and to the pump interior.



1 = Distributor-pump plunger
2 = Non-return valve
3 = Starting spring
4 = Suction side of supply pump
5 = Starting valve
6 = Pump interior
7 = Control throttle
8 = Control collar
9 = Control circuit
10 = Additional bore
11 = Inlet bore to starting plunger
12 = Spill port to control circuit
13 = High-pressure circuit inlet port

With the control throttle (7) in the maximum-speed position, this bore (10) of the control circuit is additionally connected to the inlet port to the distributor-pump plunger (1) via a transverse groove in the control throttle (7). The fuel of the control circuit (9) can thus flow back into the pump interior via the control throttle (7) and the distributor-pump plunger (1). The starting fuel delivery is shut off (transition from starting to full load) as usual by the pump interior pressure.

In the idle position, the connection of the additional bore (10) in the control circuit to the distributor-pump plunger (1) is interrupted.

There is thus no starting fuel delivery.

Note on testing:
When testing the starting fuel delivery, the speed-control lever must be up against the maximum-speed stop.

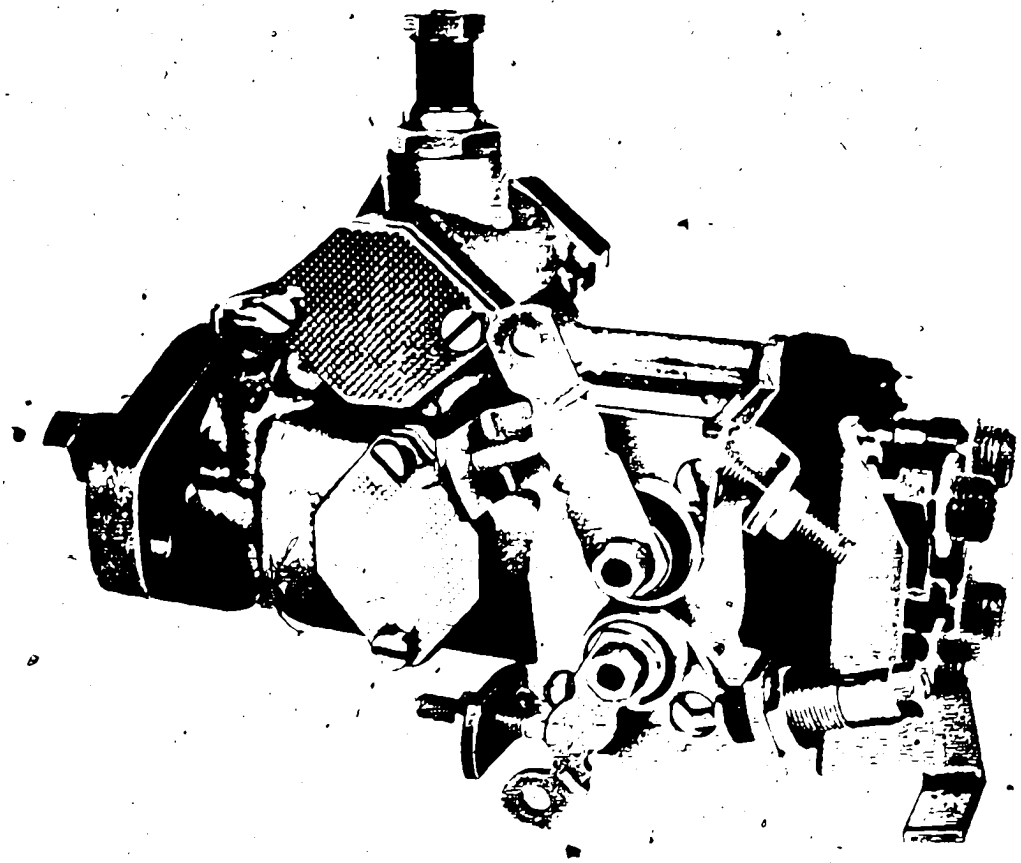
Please direct questions and comments concerning the contents to our authorized representative in your country.

BOSCH

REPAIR INSTRUCTIONS

46

VDT-WJP 161/4 B
Ed. 1

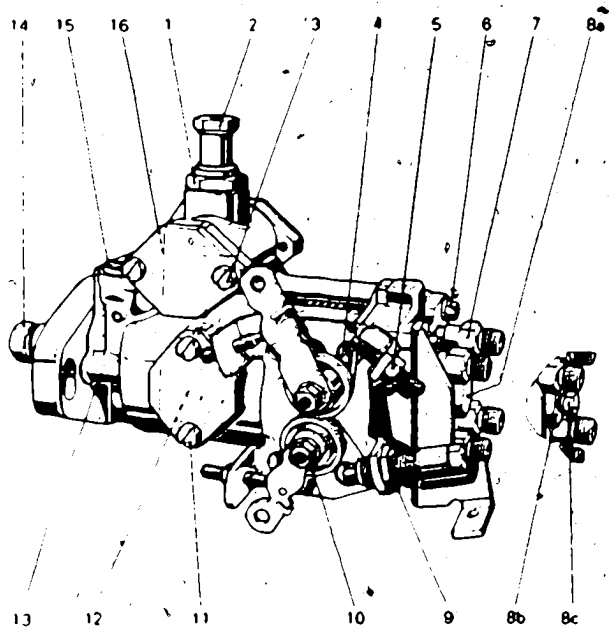


Distributor-type fuel injection pump 0 460 . .

EP/VA . . H . . C . .

1. Tools and tightening torques

Tool	Part Number Part Marking	Type	Use, Remarks
Universal clamping bracket	KDEP 2963	–	For clamping pump
Flange	1 685 720 062	EFEP 157/8	during disassembly and assembly.
Assembling sleeve	KDEP 2936	–	For protecting the O-ring while fitting on the governor control piston shaft.
Assembling sleeve	KDEP 2937	–	For protecting the O-ring while fitting on the throttle shaft.
Extractor hook	KDEP 2938	–	For removing the seals under the delivery valves in the hydraulic head.
Assembling sleeve	KDEP 2939	–	For protecting the radial seal during installation of the drive shaft.
Spacer sleeve	KDEP 2935	–	For adjusting the timing piston spring initial tension.
Measuring device	KDEP 2931	–	For setting prestroke
with Extension	KDEP 2931/1	–	For M 12 x 1 threads (piston dia. 8, 9 and 10 mm/0.315, 0.354 and 0.394 in).
Extension	KDEP 2931/2	–	For M 14.5 x 2 threads (piston dia. 11 and 12 mm/0.433 and 0.472 in).
Lapping mandrel	KDEP 1020	–	
Puller	KDEP 1021	–	
Testing device	KDEP 1022	–	For repairing the hydraulic head.
Measuring device	KDEP 1023	–	
Spring tester	KDEP 1024	–	
Lapping paste	5 837 010 105	Ft 26 v 14	50 g (1 3/4 oz) tin
	150		500 g (1.1 lb) tin
Lapping paste	5 837 011 105	Ft 26 v 16	50 g (1 3/4 oz) tin
	150		500 g (1.1 lb) tin



Tightening torques in kgf.m (lbf.ft)

1	Overflow valve M 20 x 1	4 - 6	(28.9 - 43.4)
2	Inlet union screw M 12 x 1.5	2 - 2.5	(14.5 - 18.1)
3	Slotted cheese-head screw M 6	0.5 - 0.6	(3.6 - 4.3)
4	Countersunk flat bolt	0.5 - 0.9	(3.6 - 6.5)
5	Hex. nut M 6	0.5 - 0.6	(3.6 - 4.3)
6	Slotted cheese-head screw M 6	1.1 - 1.3	(8.0 - 9.4)
7	Delivery valve holder M 14 x 1.5	4.0 - 4.5	(28.9 - 32.5)
8a	Screw plug M 12 x 1 for piston dia. 8, 9, 10 mm	4 - 6	(28.9 - 43.4)
8b	Screw plug M 14.5 x 2 for piston dia. 11 and 12 mm	6 - 7	(43.4 - 50.6)
8c	Hexagonal screw M 6	0.4 - 0.5	(2.9 - 3.6)
9	Hex. nut M 12 x 1	1.4 - 1.8	(10.1 - 13.0)
10	Hex. nut M 6	0.6 - 0.7	(3.6 - 5.1)
11	Slotted cheese-head screw, or Hex. screw, M 6	0.5 - 0.6	(3.6 - 4.3)
12	Slotted cheese-head screw, or Hex. screw, M 6 (for securing timing pointer)	0.2 - 0.3	(1.5 - 2.2)
13	Countersunk flat bolt M 5 (vane type pump)	0.4 - 0.55	(2.9 - 4.0)
14	Hex. nut M 12	6 - 7	(43.4 - 50.6)
15	Threaded insert M 12 x 1.5 (fuel inlet)	4 - 4.5	(28.9 - 32.5)
16	Pressure regulating valve M 14 x 1	0.8 - 0.9	(5.8 - 6.5)

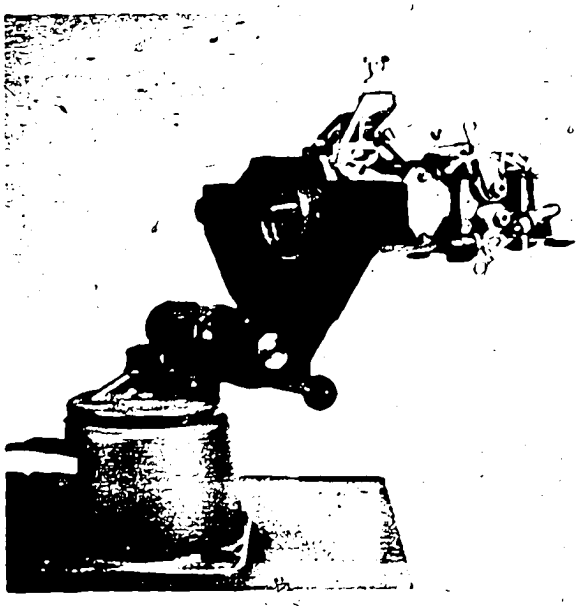
We recommend that an initial inspection be carried out on the test bench before disassembly of the distributor-type fuel injection pump.

Such a procedure will aid in determining the extent of repairs that must be undertaken, for example, whether repairs are necessary to the hydraulic head.

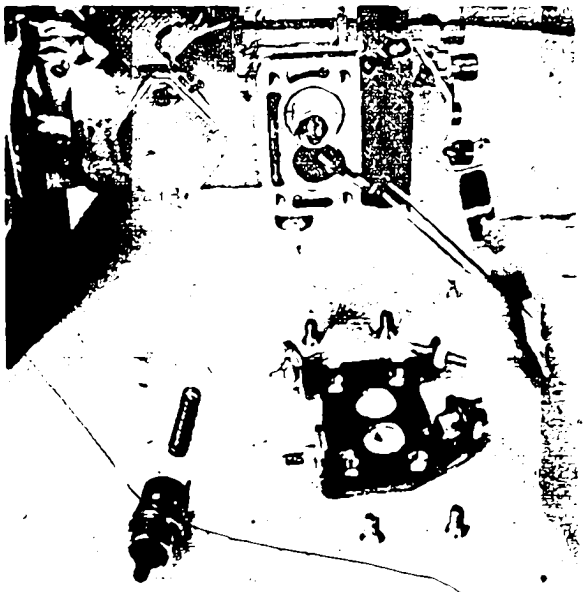
2. Disassembly

Remove coupling.
Clamp the pump with the clamping bracket and appropriate flange to the clamping support.

Dismantle the delivery rate control lever (governor control piston operation for delivery rate control) and speed control lever (throttle operation for speed control).
Remove washer from under delivery rate control lever, and torsion springs.



1



Remove stop plate.

Remove shaft and bushing of delivery rate control device and governor control piston spring.

2 Take out governor control piston.

Disassemble shaft and bushing. To do this place the threaded end of the shaft on the workbench and press down on the bushing.

Note

Do not lose the washer between the bushing and shaft.

3 Remove O-rings from shaft and bushing.

4

Take out shaft and bushing of speed control device, and throttle with accompanying spacer ring.

Attention

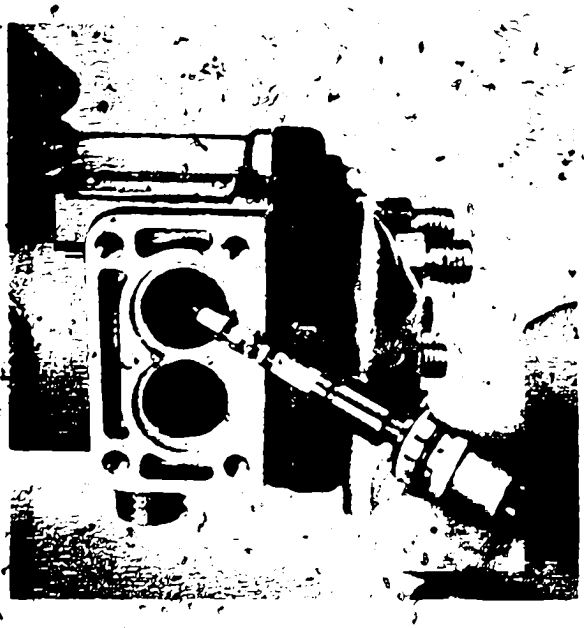
The throttle and spacer ring have been matched to the hydraulic head during production. The throttle, therefore, must only be installed along with its accompanying ring. Do not lose the spacer ring.

Throttle fitting for EP/VA..H..C.. differs according to pump model.

1 Jaw fitting — such as the throttle fitting on EP/VA..H..B..

2 Pin fitting — such as the governor control piston fitting

3 Collar fitting — first introduced on some models of distributor-type pumps EP/VA..H..C.. Therefore, only the latter fitting method will be discussed in these instructions.



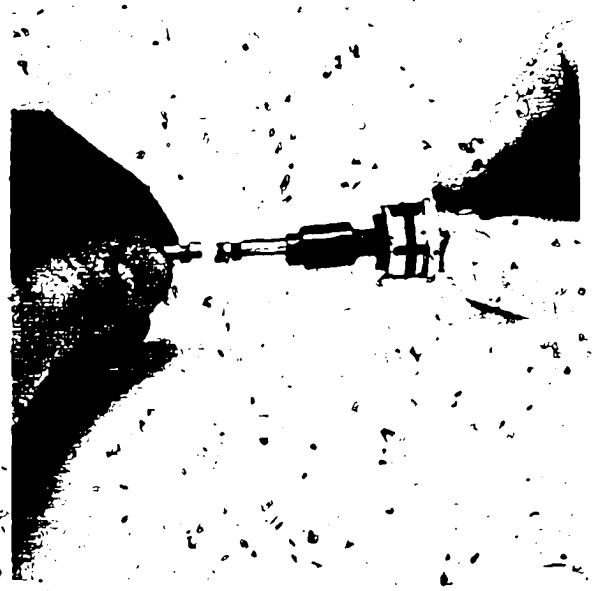
4

For collar fitting, separate the throttle from the bushing and shaft.

Place the threaded end of the shaft on the bench and disassemble shaft and bushing by pressing down on the bushing.

Note

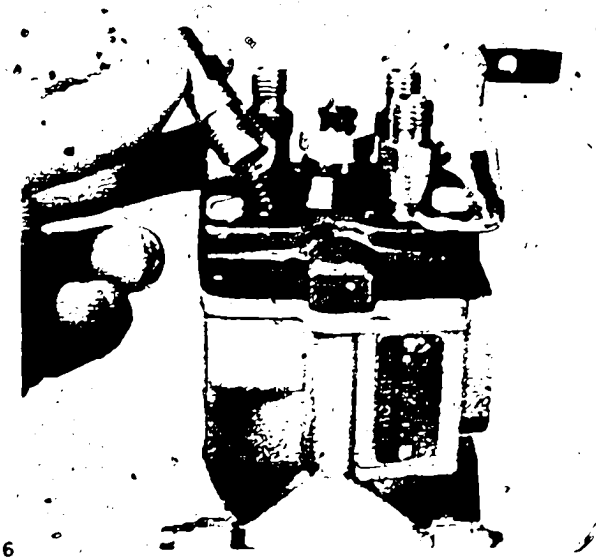
Do not lose the washer between the bushing and shaft. Remove O rings from shaft and bushing.



5

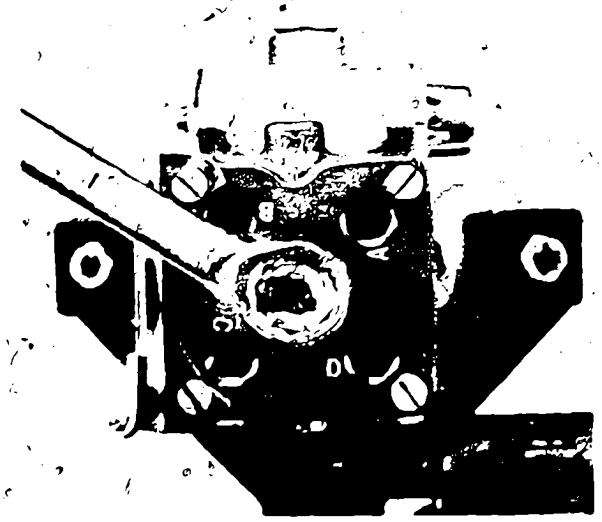
Remove delivery valve holders, springs, washers and filters as well as delivery valves. The hydraulic head ports are lettered A, B, etc. Lay out delivery valve holders, springs, valves, etc. according to these letters so that they can be reinstalled in the same ports.

Remove the seal rings under the delivery valves with the extractor hook.



6

Unscrew the central screw plug. Remove the seal ring.

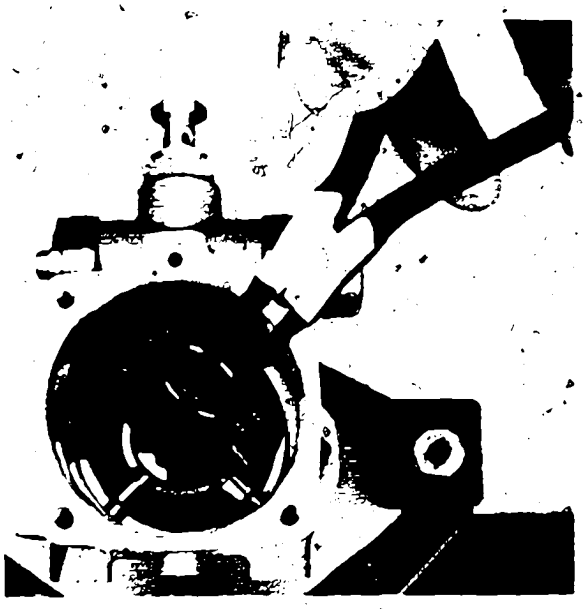


7

Clamp the pump vertically so that the rollers do not fall out.

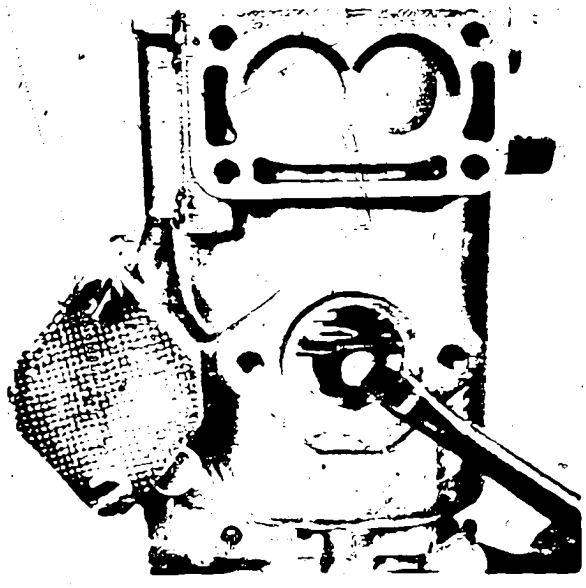
Unscrew the hydraulic head fastening screws and pull it upwards and off by hand. Remove the small seal ring between hydraulic head and pump housing.
Remove the plunger from the hydraulic head. Do not lose the washer under the plunger base and the washers under the spring seat.

Take out the cam plate.



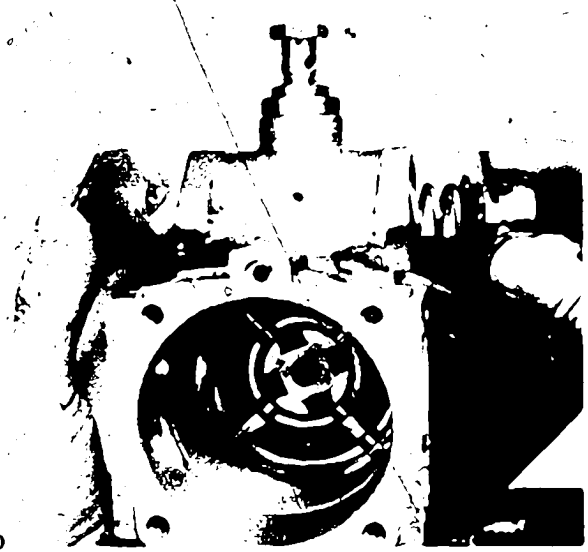
8

Remove the side cover, take out the seal ring and unscrew the timing pointer.



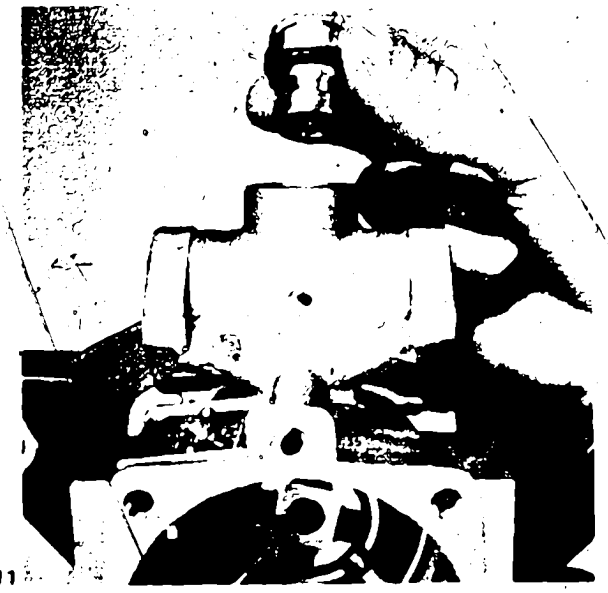
9

Remove the covers on both sides of the timing device.
Remove the seal rings and spring.



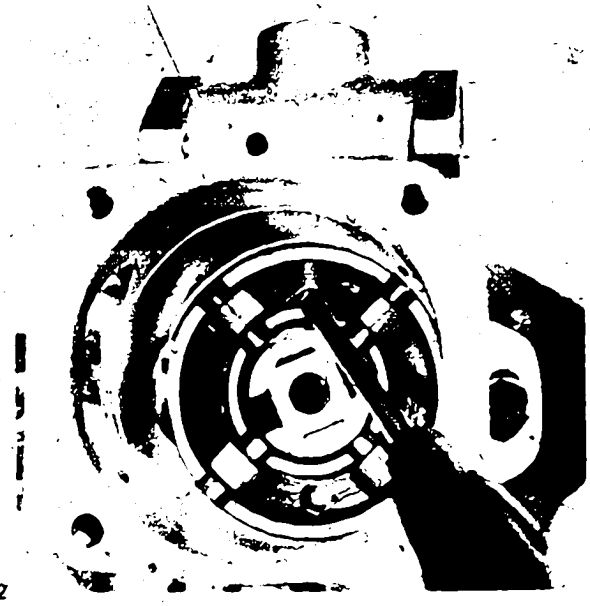
10

Take out the overflow valve...
Remove O-ring.



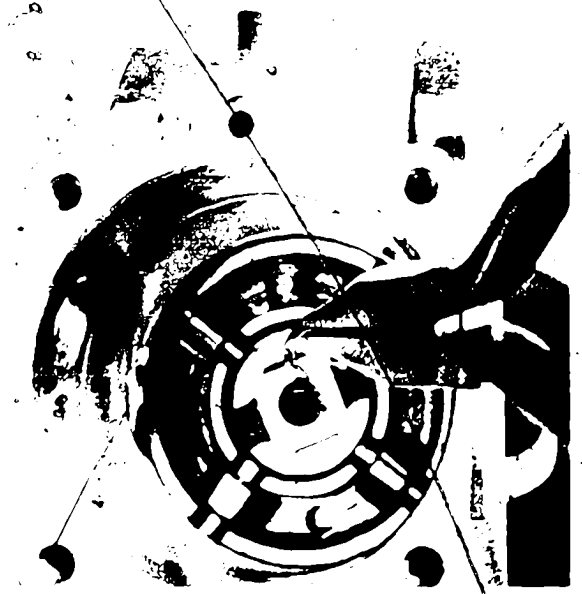
11

Lift the clip with a screwdriver.



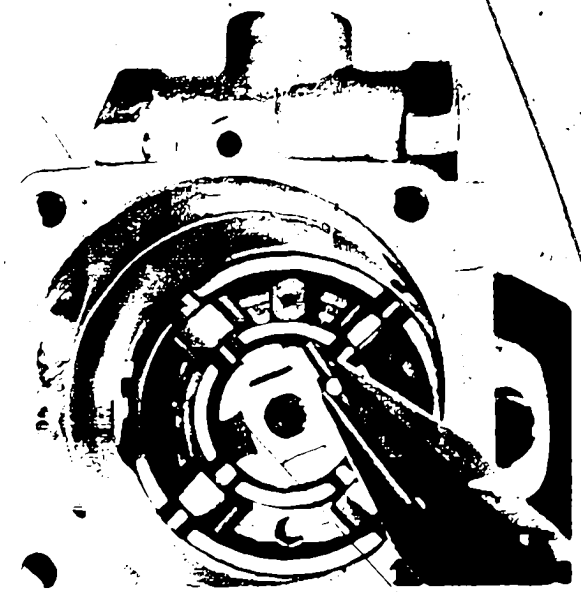
12

Grip and remove the clip with pliers.



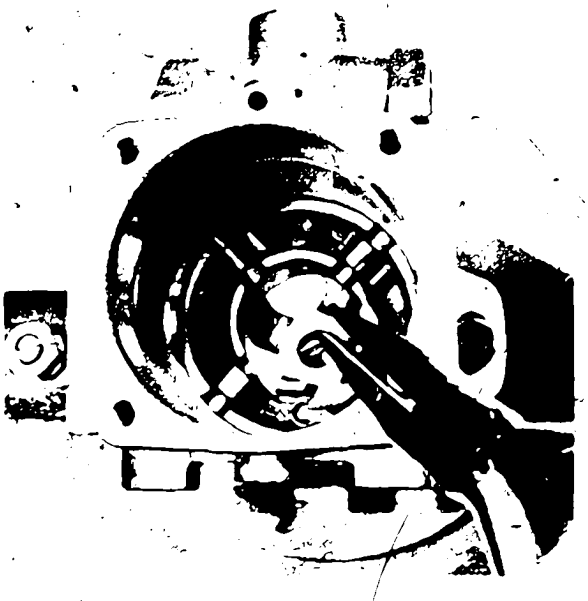
13

Take out the locking-pin.



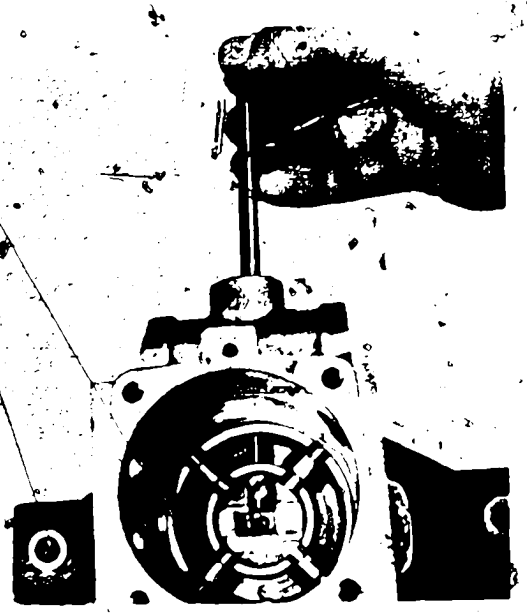
14

Remove the cross type disc.



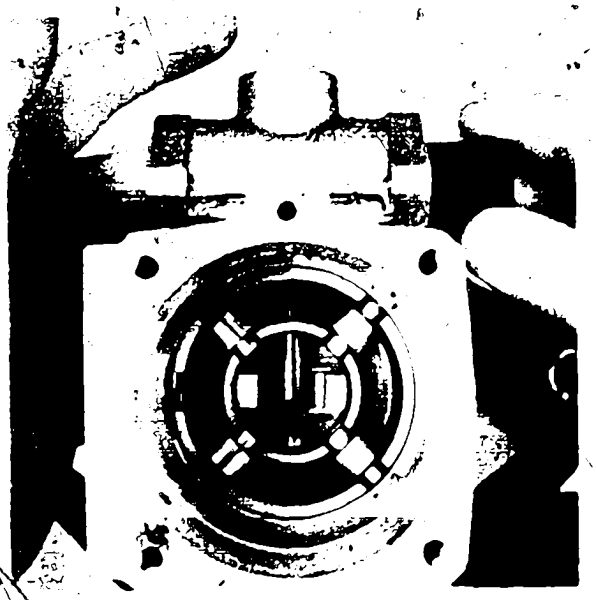
15

Push the connecting pin for the timing device and cam roller ring towards the center of the pump.



16

Push out the timing piston and slider.

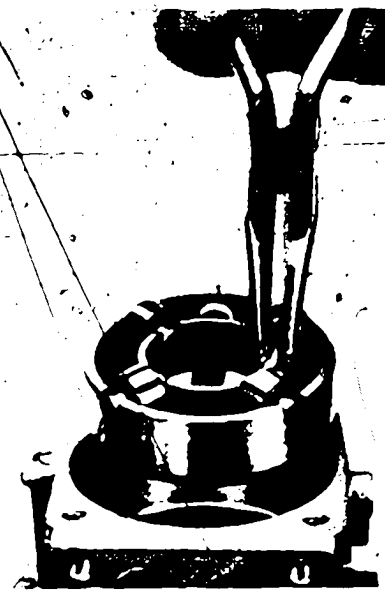


17

Pull the cam roller ring and connecting pin up and out.

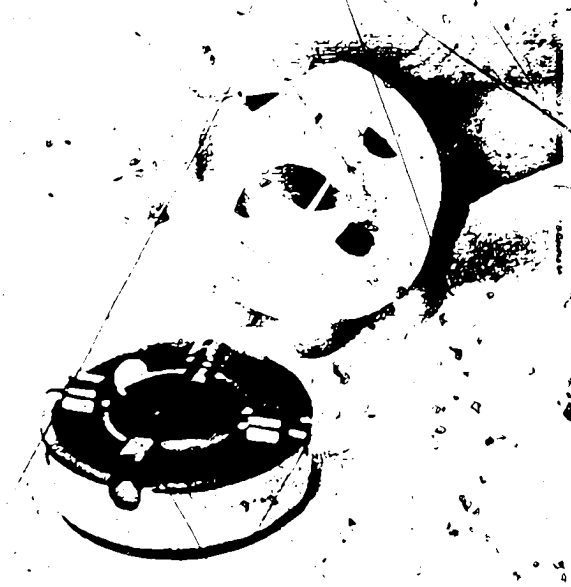
Note

Do not tilt the cam roller ring during removal. Do not interchange rollers.



18

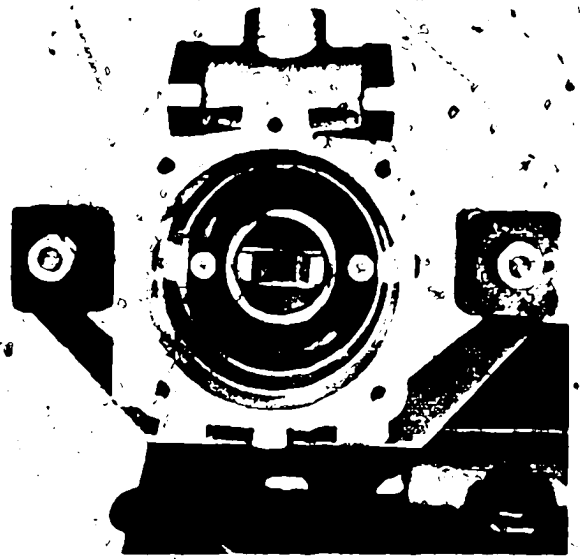
Push the connecting pin out of the cam roller ring. Place a protective cap over the cam roller ring to prevent the rollers from falling out (If necessary, manufacture according to drawing 1, page 30).



19

Remove the vane type fuel supply pump together with the support ring and drive shaft.

To do this, unscrew both fastening screws.

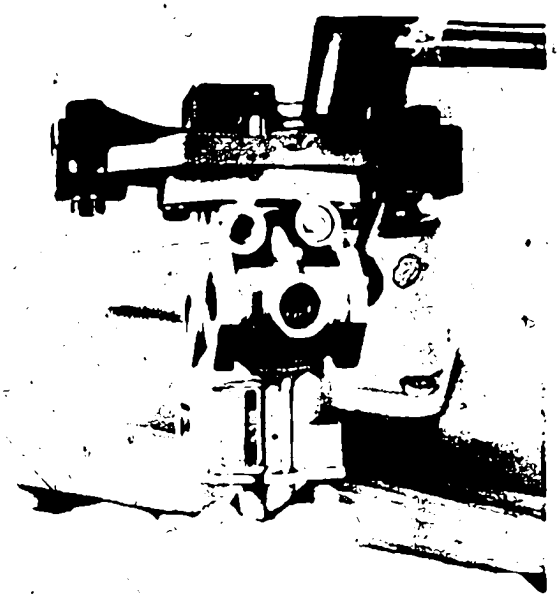


20

We recommend the use of an auxiliary tool (manufacture according to drawing 2, page 30) for the following step.

Grasping the drive shaft, tilt the pump housing downwards.
Whilst constantly tapping lightly with rubber hammer pull drive shaft, together with the fuel pump and support ring out trough the bottom of the housing.

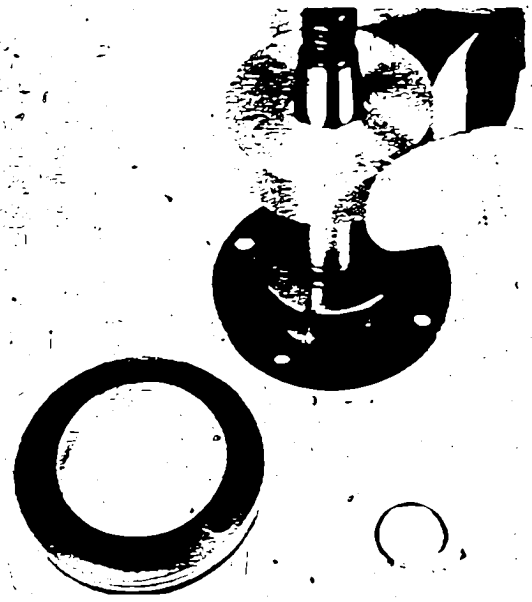
Do not tilt the support ring or eccentric race.



21

Remove the retainer.

Remove the eccentric race and place the assembly cup (manufacture according to drawing 3, page 31) over the pump impeller and vanes.

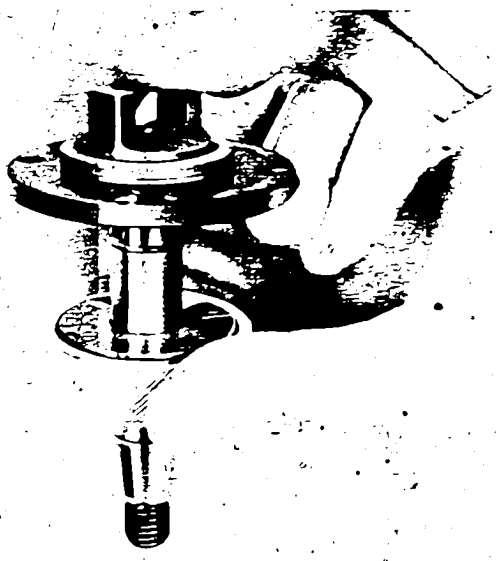


22

Invert the drive shaft.

Impeller and vanes now lie in the assembly cup.

Pull the assembly cup, Woodruf key, support ring and washer down and off of the shaft.



23

Remove the pressure regulating valve.
Remove O-rings. (Fig. 24)

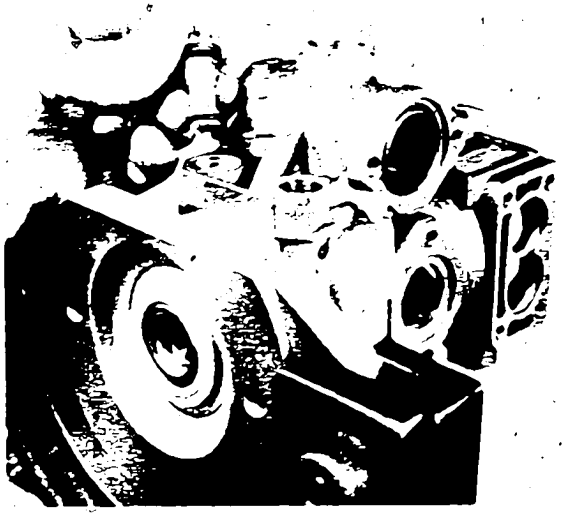
3. Testing the component parts

Clean each individual part.
Replace worn or damaged components. In doing so please note that the following parts are to be treated as one unit and must be replaced **together**: hydraulic head with plunger, governor-control piston and throttle; pump housing with timing piston, cam roller ring with rollers and washers, pump impeller with vanes and eccentric race.

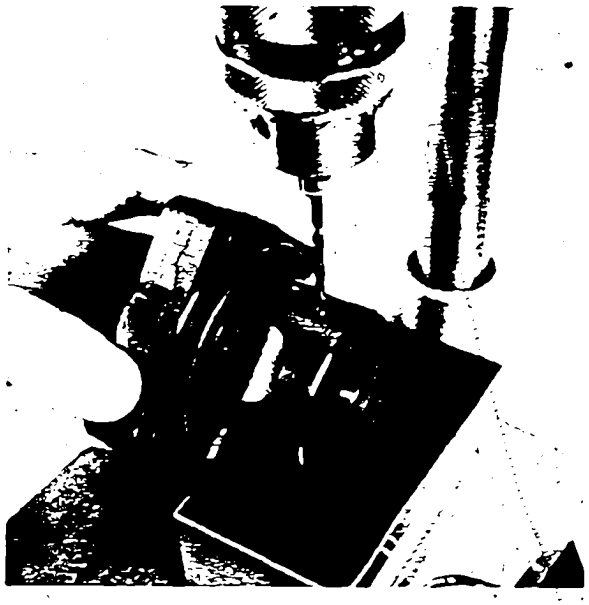
New seals must be fitted after every repair.

Prior to assembly, dip all components (including seal and O-rings) in test oil.

Carry out pump assembly and all work on the hydraulic head (subsequently described) in clean surroundings and on a clean workbench.



24



25

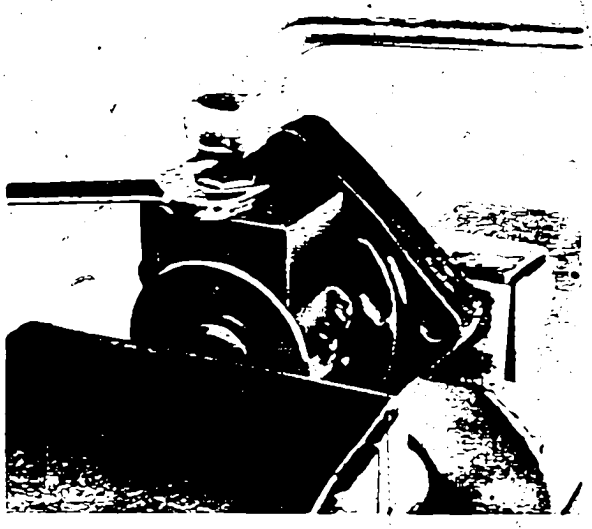
4. Repairing the hydraulic head

A leaking non-return valve (ball valve) usually causes irregular, idle and/or excessive idle speed of the engine. The prescribed idle speed is not adjustable.

If, on initial inspection, the fuel delivery at idle is incorrect (excessive) then it is to be expected that the non-return valve is leaking.

A hydraulic head with leaking non-return valve is repaired in the following way:

Drill a 3.2 mm/0.126 in dia. hole approx. 5.5 mm/0.22 in deep into the plug and tap an M 4 thread. (Fig. 25)



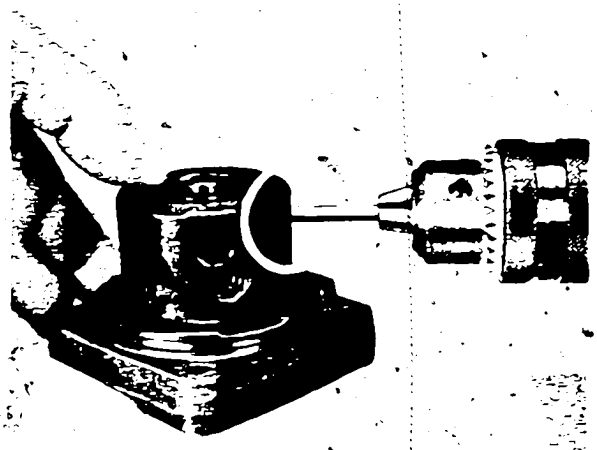
26

Using a puller remove the plug from the hydraulic head. (KDEP 1021, total length 37 mm/1.46 in, can be used if the puller support is shortened by 6 mm/0.24 in). Place the puller support on the hydraulic head, push the screw through the hole in the support, thread it into the plug and tighten slightly (only thread M 4!). Whilst holding the screw securely to prevent it turning, pull out the plug by tightening the nut.

Remove spring, spring seat and ball. (Fig. 26)

Wash and blow out the hydraulic head.

Inspect the valve seat with an illuminating magnifier. Light re-working of the valve seat can be carried out by re-lapping. Badly damaged valve seats **cannot** be re-worked and the hydraulic head must be replaced.



27

Clamp drill in clamping support. Lower the work table of the clamping support or remove it. Tighten the lapping mandrel in the drill and smear the lapping cone with rough lapping paste (Ft 26 v 16). Oil the lapping mandrel shaft.

Attention: There is to be no lapping paste on the lapping mandrel shaft.

Switch on the drill and lap the valve seat by lightly applying intermittent pressure against the lapping mandrel while at the same time rotating the hydraulic head back and forth (see Fig. 27).

Clean the lapping paste from the hydraulic head and blow it out. Re-lap with fine lapping paste (Ft 26 v 14).

Visually inspect the valve seat with an illuminating magnifier.

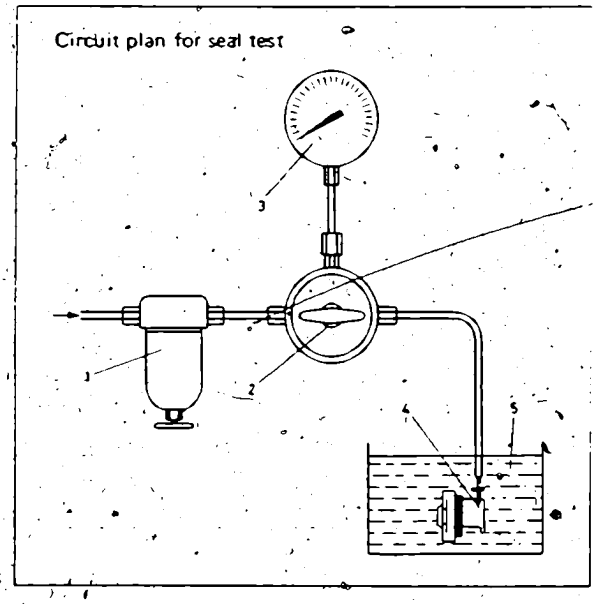
If necessary, re-lap again. (Fig. 27)

Test the valve seat for sealing. To do this, insert the testing device in the valve hole in the hydraulic head and clamp it by turning the knurled screw clockwise. Connect compressed air to the testing device through a pressure regulator.

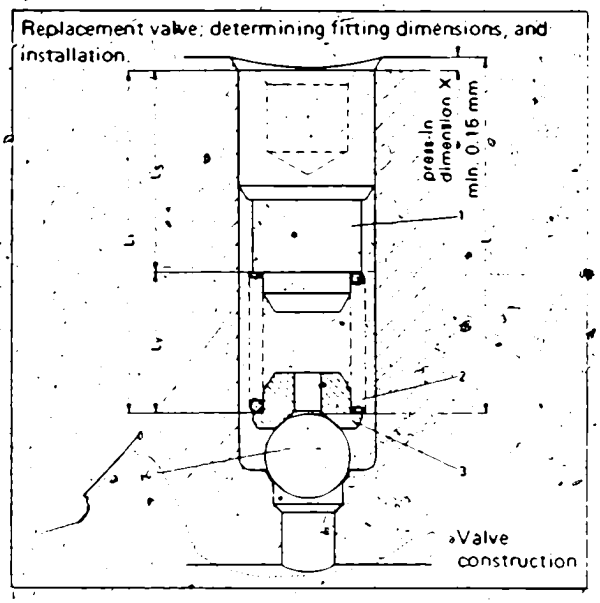
Set the pressure to 2 kgf/cm² (28.5 lb/in²) and submerge the hydraulic head in the oil bath.

No air bubbles should appear from the non-return valve port in the plunger bore.
If necessary, re-lap again. (Fig. 28)

1 = water separator
2 = pressure regulator
3 = pressure gauge
4 = hydraulic head with testing device
5 = oil bath oil 61 v 1



28



29

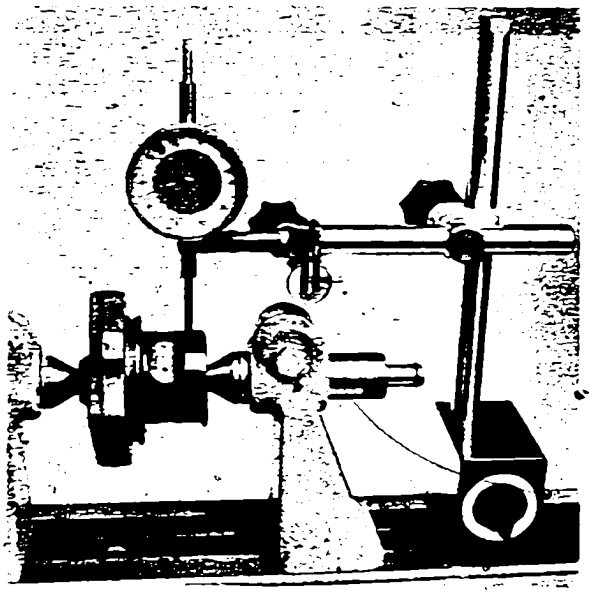
1 = plug
2 = valve spring
3 = spring seat
4 = valve ball

Replacement valve, determining fitting dimensions, and installation.

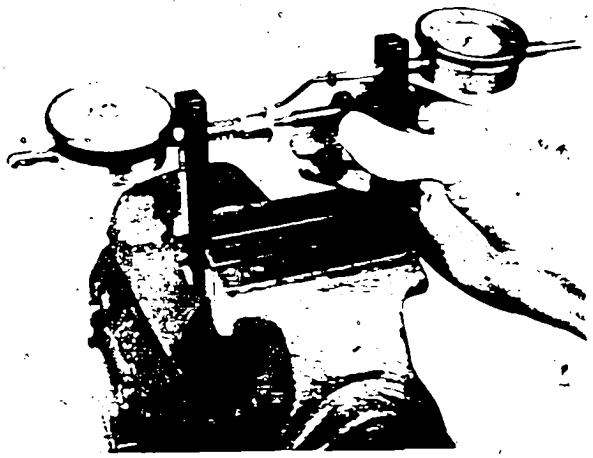
Clamp the hydraulic head in such a way that the valve bore is vertical.

Place the ball on the valve seat and determine the dimension "L" (measuring points: hydraulic head outer diameter to valve ball) with dial indicator and measuring stand.

A measuring foot must be used with the dial indicator; it must have a flat contact face which must touch the highest point of the ball. (Figs. 29 and 30)


30

D3



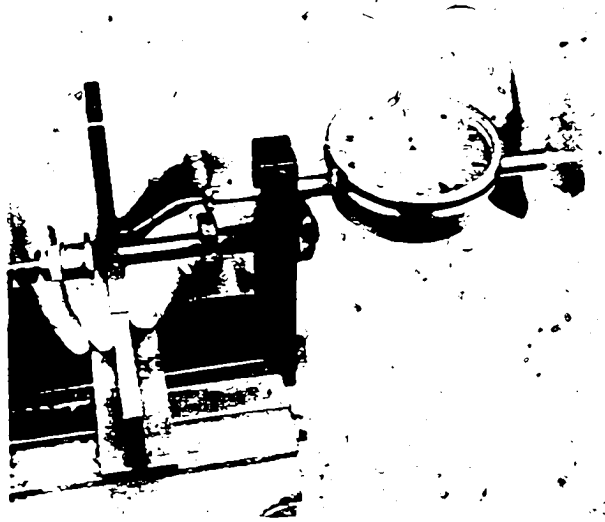
31

Clamp the measuring device with spring tester and dial indicator in a vise and determine dimension "L1". "L1" = "Lv" + "Ls" (where "Lv" = length of pre-loaded spring and "Ls" = length of plug from spring shoulder to end face), see Fig. 29.

Place the bent measuring foot of the dial indicator up against the spring tester measuring sleeve; pre-load the indicator 10 mm/0.4 in and clamp it.

Set the spring tester (unloaded) to "0". Slide the valve spring (without valve seat) on to the plug and insert it between the spring tester measuring sleeve and the adjusting pin of the measuring device (plug against adjusting pin).

Press the spring against the spring tester measuring sleeve by turning the adjusting pin until the prescribed spring pre-load Pv = 0.41 kg (0.902 pounds) is shown on the spring tester. Tighten the lock nut of the adjusting pin.



32

Now place the dial indicator measuring foot up against the measuring sleeve of the spring tester and set the indicator to "0". Remove valve spring and plug from the measuring device. In doing so, however, do not change the setting of the adjusting pin.

Place a try square against the adjusting pin and with the dial indicator measure the distance to the try square. Note dial indicator reading and list it as "L1". Dimension "X" = "L" – "L1", where "X" is the press-in depth, see Fig. 29.

Wash and blow out hydraulic head.

Lay the ball on the valve seat.

Insert the plug together with spring and spring seat and press in the plug to the depth determined (dimension "X") by using an appropriate mandrel (manufacture according to drawing 4, page 31).

Measure the press-in depth (measuring points: hydraulic head outer diameter to threaded plug upper face) using dial indicator and measuring stand.

D4

Re-working of the KDEP 1020 lapping mandrel.

The lapping mandrel cone and shaft must be flawless. Lapping mandrels with worn shafts should be disposed of.

Lapping mandrels with worn or scored cones can be re-worked by using a nozzle reconditioning tool kit in combination with a drill and clamping support in the following manner:

Clamp the drill in the support.

Clamp the 5 mm/0.2 in dia., 20 mm/0.79 in long, guide bushing from the nozzle reconditioning tool kit in the support (with stop).

Attention:

Use only the support with stop, the support without stop has a different angle of inclination at the bevelled surfaces.

Clamp the lapping mandrel in the drill.

Place the support on the clamping support work table and adjust the height of the work table so that the lapping mandrel can be inserted into the guide bushing in the support.

Clamp the work table securely in this position.

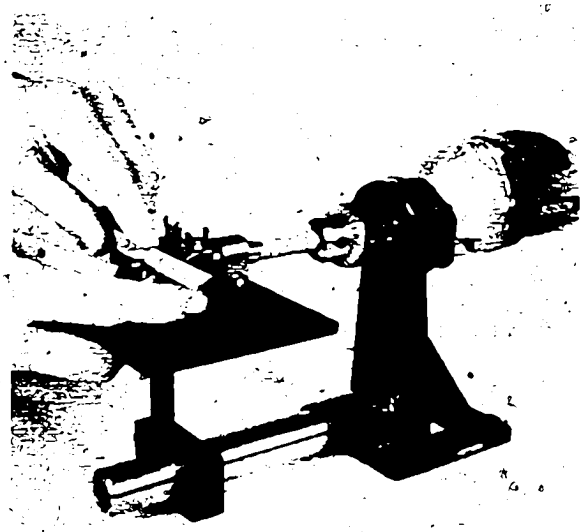
Remove the lapping mandrel and then reclamp it in the drill using the appropriate rubber coupling from the nozzle reconditioning tool kit.

Coat the lapping mandrel shaft with oil and insert it in the support guide bushing.

Switch on the drill and holding the tool kit oilstone on the bevelled surface of the support, re-work the cone of the lapping mandrel. While doing so keep the oilstone generously oiled.

After re-working, the lapping mandrel cone must be smooth and free of scores.

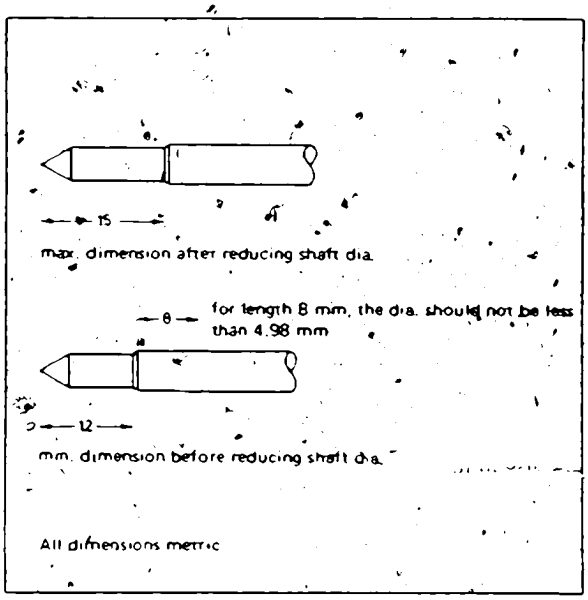
For care and maintenance of the oilstone refer to the manufacturer's instructions supplied with the tool kit. (Fig. 33)



33

Re-grinding and dimensional limits of the lapping mandrel

After repeated re-grinding of the cone, the shaft dia must be reduced to 4.5 mm/0.177 in. (Fig. 34)



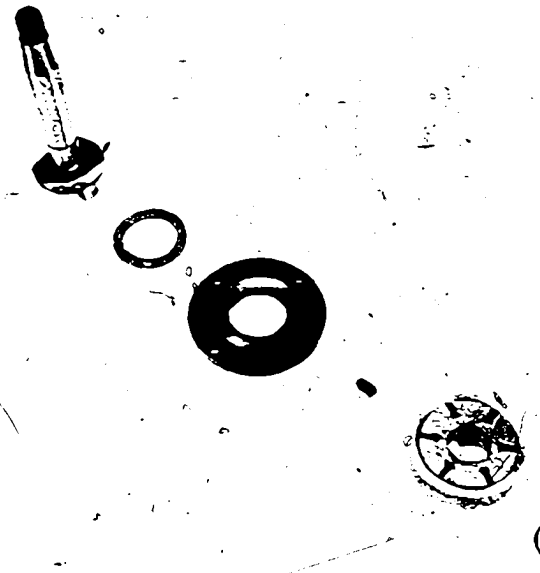
34

5. Assembly

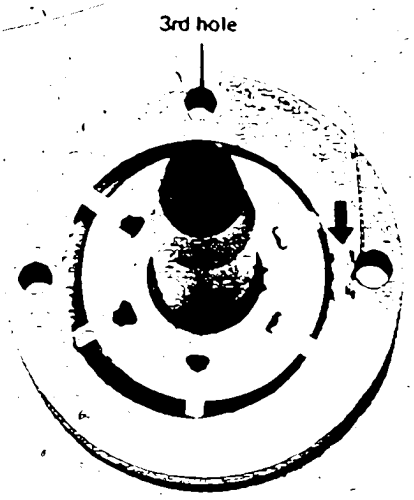
Drive shaft and fuel supply pump

Assemble the drive shaft and supply pump in the following order: drive shaft, washer, support ring (smooth side toward the impeller), Woodruf key and impeller with vanes. Secure with retainer.

The bevel turned in the impeller must be on the retainer side.



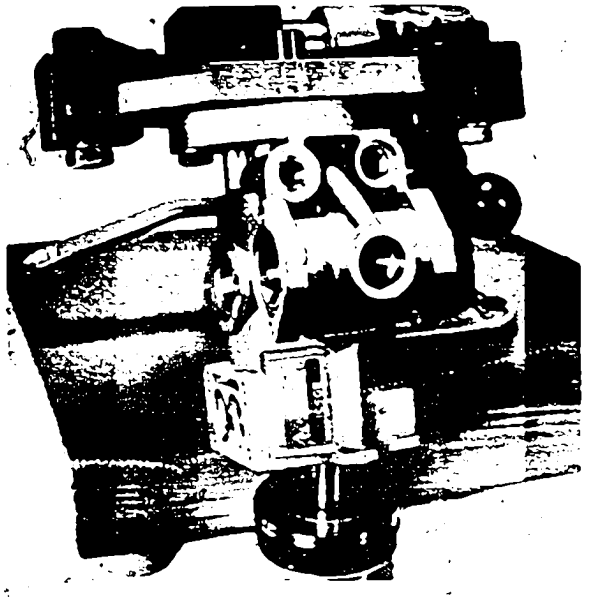
35



The two holes lying opposite one another in the eccentric race are located at different distances from the inner bore. When fitting the eccentric race, the hole furthest from the inner bore is to be noted (see arrow). If the direction of rotation of the pump is given as "R" (clockwise) the hole must be on the right as one looks at the threaded end of the drive shaft. With direction of rotation "L" (counterclockwise) the hole in question must be on the left.

The third hole is always on top whether clockwise or counterclockwise direction of rotation.

36



Secure the pump housing with flange and bracket in the clamping support and swivel it downwards.
In order to protect the radial seal fit the assembling sleeve on the drive shaft. Insert the drive shaft with delivery pump into the pump housing, taking care that the support ring or eccentric race are not tilted.
To do this, the auxillary tool (manufactured according to drawing 2, page 30) is used.

Swivel the pump housing 180° upwards. While doing so hold the drive shaft secure.

Before screwing in the fastening screws ensure that all three holes in the support ring are aligned with those of the eccentric race and that the center hole points upwards toward the timing control.

37 Screw in both fastening screws.

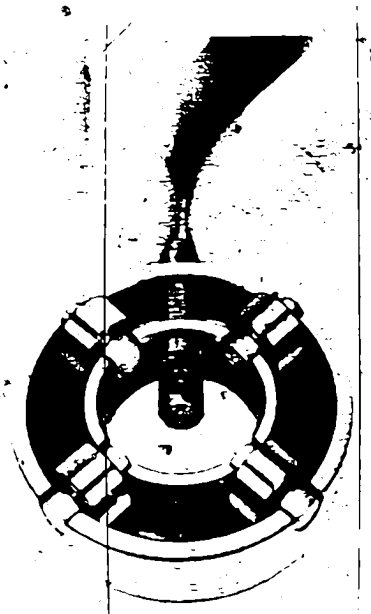
Cam roller ring

The cam ring rollers should not be allowed to fall out nor be interchanged. Should this occur, however, the roller heights must be checked again. The difference between roller heights is not to exceed 0.02 mm/0.0008 in.

When assembling the rollers, make sure that the thrust washers are located on the outside of the rollers. The conical (rounded) side of the washers must point toward the outer ring.

Insert the connecting pin.

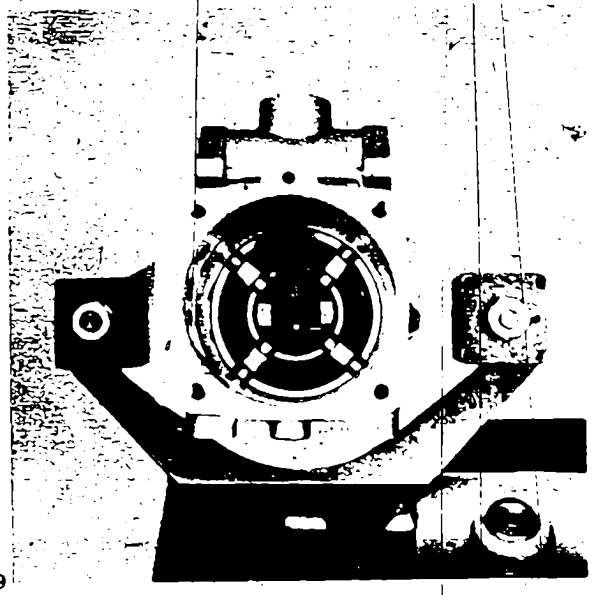
Fitting position: locking pin hole vertical. Flat surface on top and towards the cam roller ring center (see Fig. 38).



38

Install roller cam ring. Connecting pin in the direction of timing device.

Position of drive shaft:
Drive members perpendicular to connecting pin (see Fig. 39).



39

Timing device

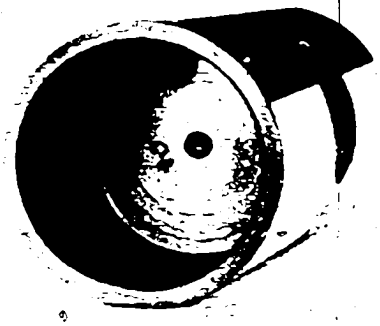
Piston fitting position:

In the opposite end of the piston to where the spring fits is a hole. Around the outside of the piston are four holes, the smallest of which must point upwards in the direction of the overflow valve.

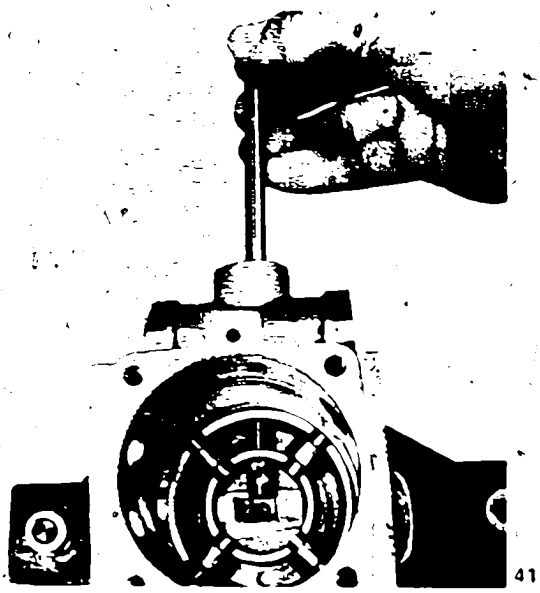
Piston installation instructions:

For direction of rotation "R" (clockwise) spring on left *
For direction of rotation "L" (counterclockwise) spring on right *

*looking at threaded end of drive shaft



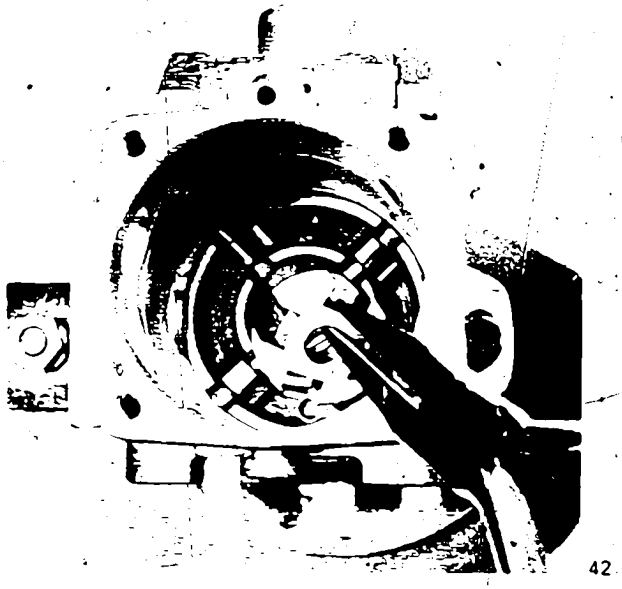
40



41

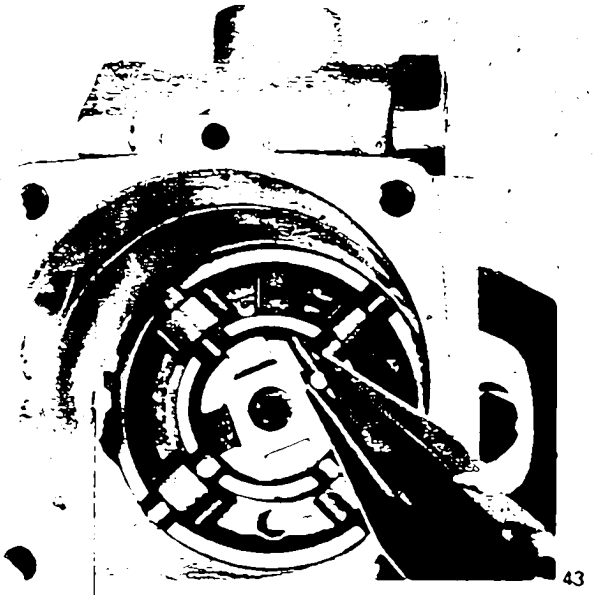
Insert timing piston and slider in the housing.

Push the cam roller ring connecting pin outwards into the hole in the slider. In doing this, it is recommended that a guide pin be made and used to center the slider hole over the connecting pin.



42

Fit the cross-type disc.



43

Secure the connecting pin with the locking pin.

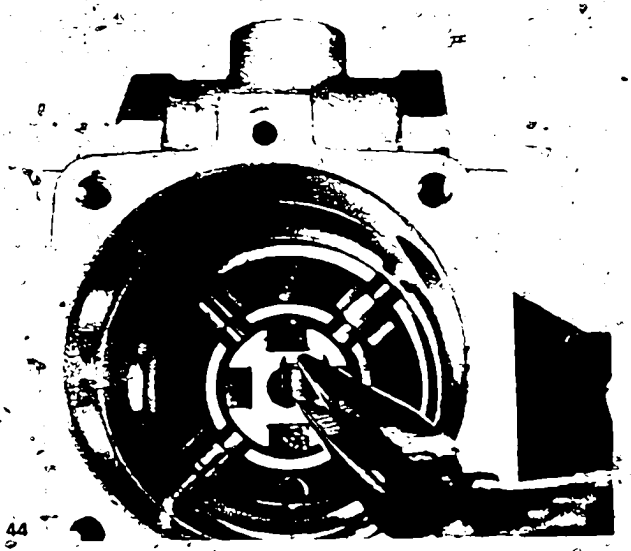
Fit the clip over the connecting pin and locking pin. (Fig. 44)

Check ease of movement of cam roller ring and timing device by pushing the timing piston back and forth.

Fit the cover on the side opposite to where the spring will be installed. Do not forget the seal.

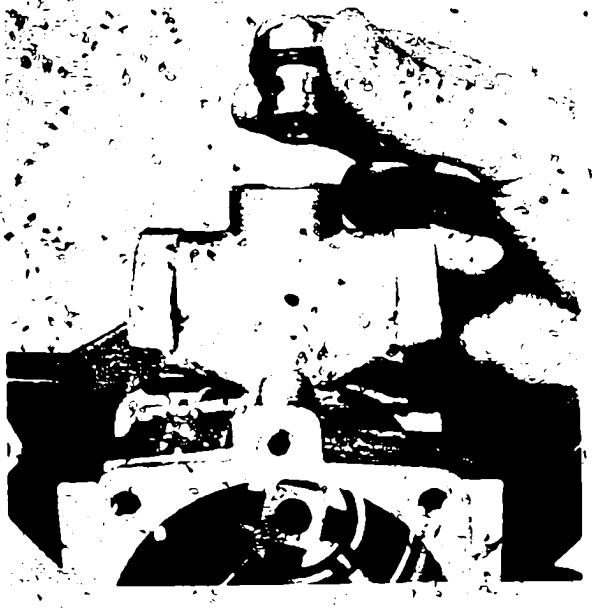
The machined side of the cover is the sealing surface.

The timing piston travel is determined by the piston length.



44

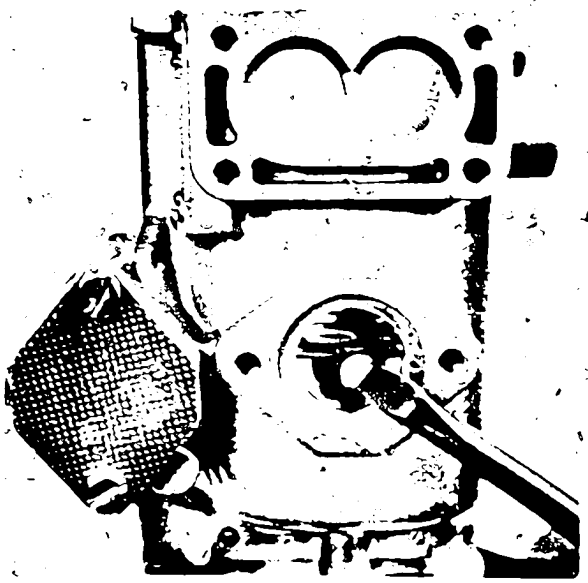
Install the overflow valve.



45

Put the timing device spring in place, put on the seal ring and the cover, with washers (washer thickness = dimension IV in Test Specifications Sheet).

46

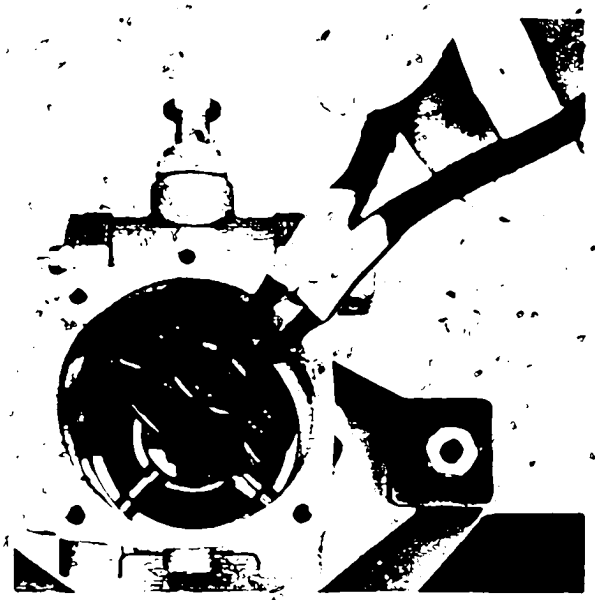


47

Secure the timing pointer on the cam roller ring with slotted cheese head screw.

Fitting position: pointer toward the pump center.

Put seal ring in place.
Put on the cover.
Machined side of the cover is the sealing surface.



48

Insert the cam plate.

Fitting position: drive pin aligned with Woodruff key groove on the drive shaft.

49

Position the washer on the cam plate so that it will fit into the plunger base recess. The washer **must remain** dry, it is not to be stuck with grease or by similar means.

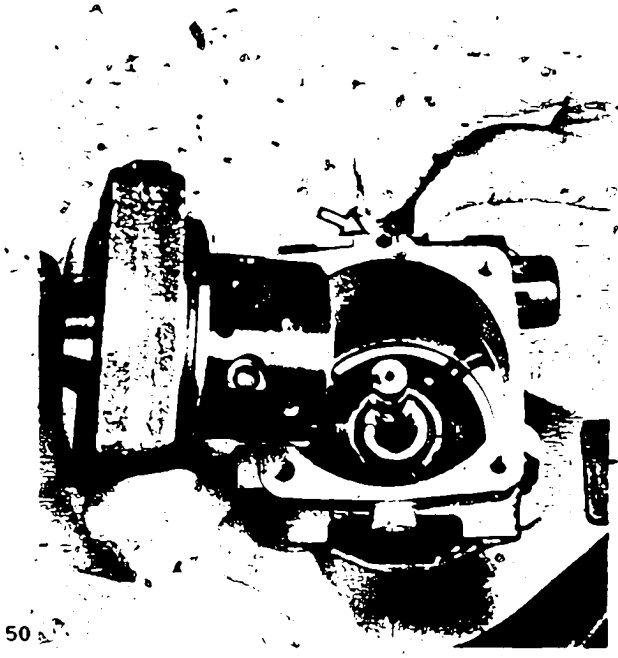
Place the plunger on the cam plate in such a way that the cam plate drive pin fits into the plunger base notch.

(Do not install the spring seat, spring seat washers, nor spring yet.)

Fit the large seal ring on the hydraulic head. Lay the small seal ring over the starting quantity relief hole in the housing (arrow).

Without tipping it or damaging the seal rings, insert the hydraulic head slowly and carefully over the plunger and into the housing.

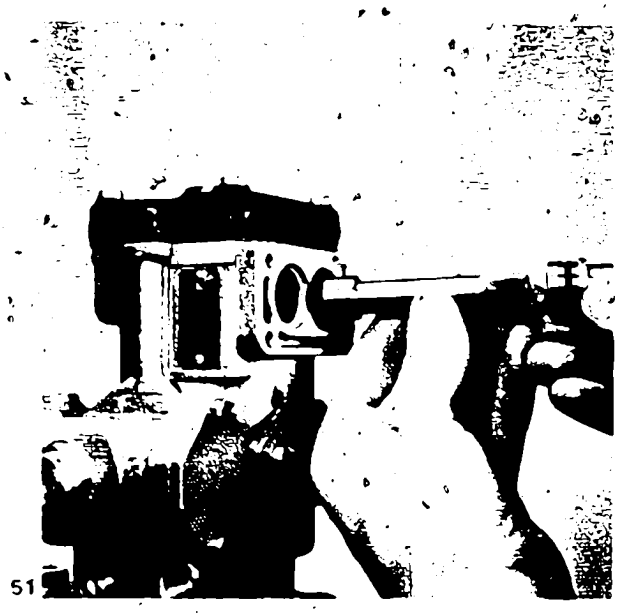
The relief bores in the housing and hydraulic head must coincide with one another.



50

To align the hydraulic head correctly with the pump housing it is recommended that the four fastening screws be tightened first. Then loosen each screw one half-turn and, using the auxiliary tool (manufactured according to drawing 5, page 31), align the hydraulic head. To do this, slide the O-ring over the bushing of the delivery rate control device. Slide the bushing over the tool and insert them both in the governor-control piston port in the housing (Fig. 51).

Position of the governor-control piston port see Section "Setting the governor-control piston spring".

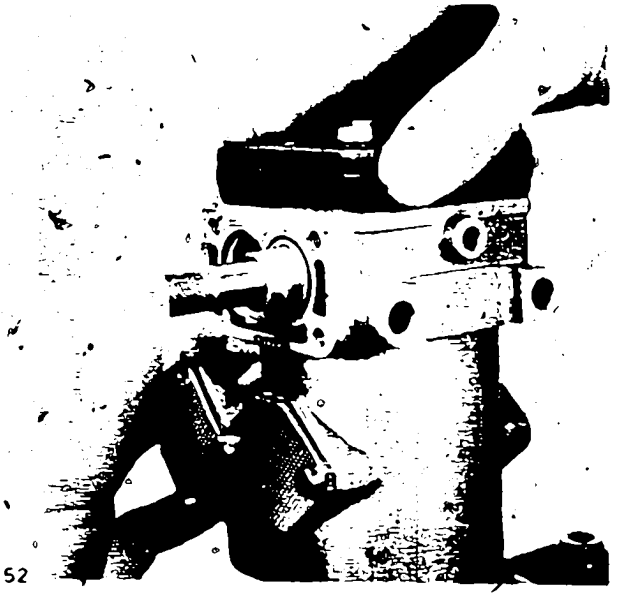


51

In this way the tool is properly guided.
Push the tool in the direction of the hydraulic head. By moving the hydraulic head lightly back and forth, it can be determined whether or not the front face of the tool is making contact across the whole of the face.

If this is the case, the pump housing holes are aligned with the holes in the hydraulic head.

Tighten the fastening screws.



52

Fit the O-ring on the shaft of the delivery rate control device.
(Use assembling sleeve.)
Do not forget the washer.

The shaft of the delivery rate control device differs to that of the speed control device in that the former has a larger bore.

53

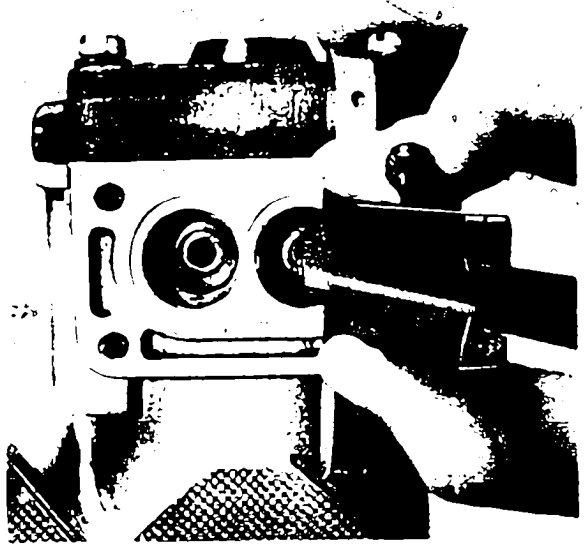
Setting the governor-control piston spring.

Insert the control piston carefully without tilting.

Normal fitting position (timing device above)

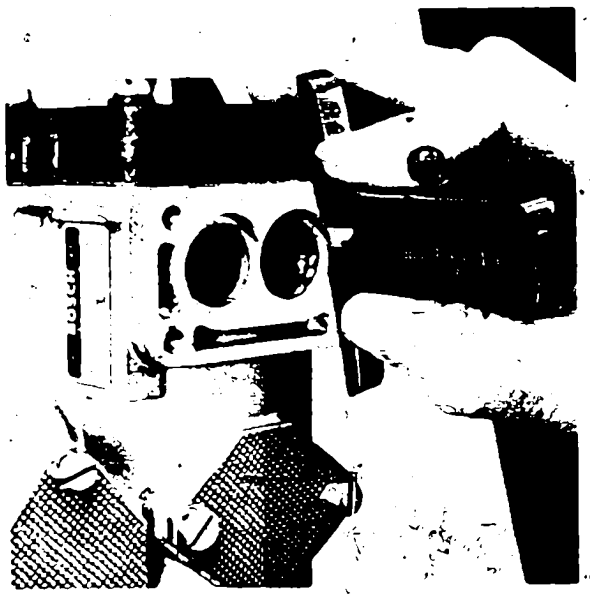
With control lever fitted on the right (looking at threaded end of drive shaft), control piston below, throttle above.

With control lever fitted on the left (looking at threaded end of drive shaft), governor-control piston above, throttle below. Push the control piston up against the mechanical stop.



Measure from the seating surface of the stop plate on the pump housing to the seating surface of the spring on the control piston (dimension a).

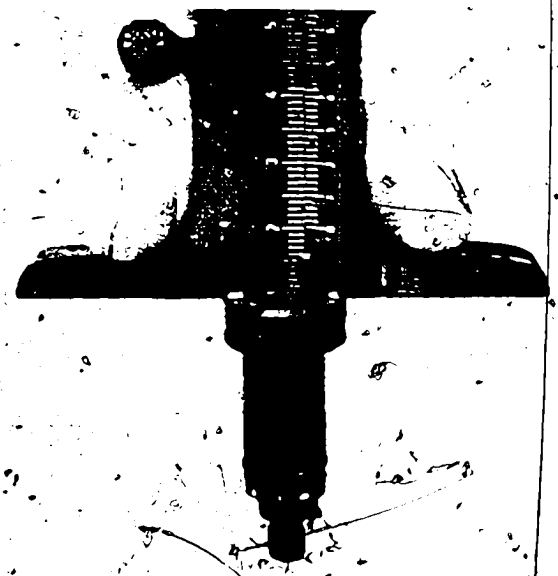
54



Measure the depth of the recess in the housing for the control device bushing (dimension b)

55 Dimension b substracted from dimension a = dimension c

Measure the distance inside the delivery rate control device shaft, from the end face to where the governor-control piston seats (dimension d). There is to be no disc in the shaft. (Fig. 56).



56

Insert the shaft, with washer, into the bushing.

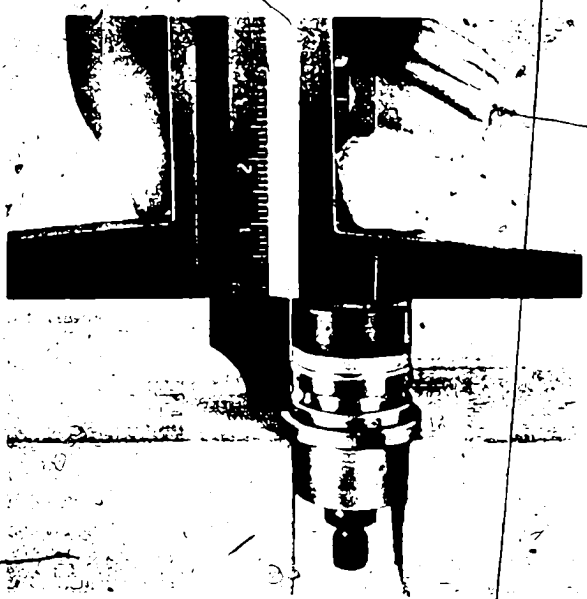
Measure the distance from the end face of the shaft to the bushing shoulder (dimension e). (Fig. 57)

Dimension e subtracted from dimension d = dimension f.

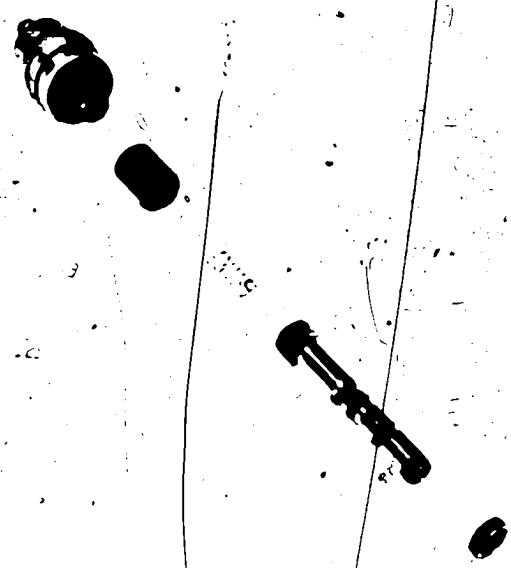
Dimension c plus dimension f = dimension g.
Dimension V (see Test Specifications Sheet) subtracted from dimension g = thickness of disc to be inserted in the shaft.

Example:

	Dimension a	27.2 mm
–	Dimension b	– 2.5 mm
=	Dimension c	= 24.7 mm
	Dimension d	19.2 mm
–	Dimension e	– 18.7 mm
=	Dimension f	= 0.5 mm
	Dimension c	24.7 mm
+	Dimension f	+ 0.5 mm
=	Dimension g	= 25.2 mm
	Dimension g	25.2 mm
–	Dimension V (Test Specifications Sheet)	– 24.2 mm
=	Disc thickness	= 1.0 mm



57



58

Fit the O-rings on the shaft (with assembling sleeve) and on the bushing of the speed control device.

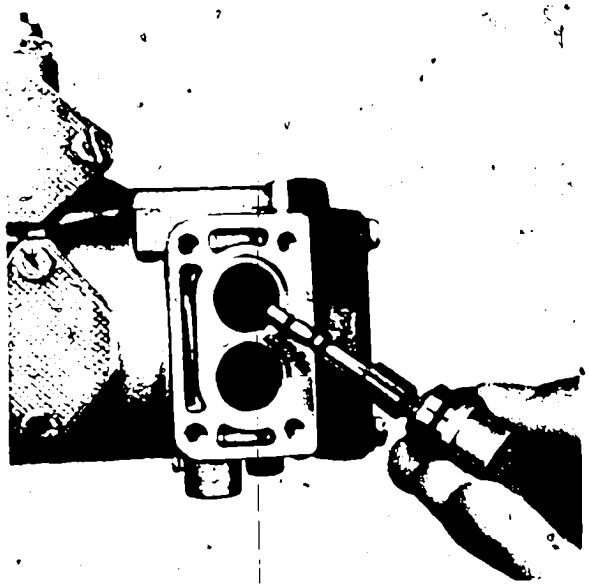
For collar fitting, assemble the speed control device in the following order:

Bushing on shaft (with washer in between), collar, spring, throttle with spacer. (Fig. 58)

With collar fitting, a collar with internal splines provides the connection between shaft and throttle.
The spring is installed to take up excess play.

Note: If the throttle helix climbs to the right the spring must be counterclockwise-wound, and vice versa.

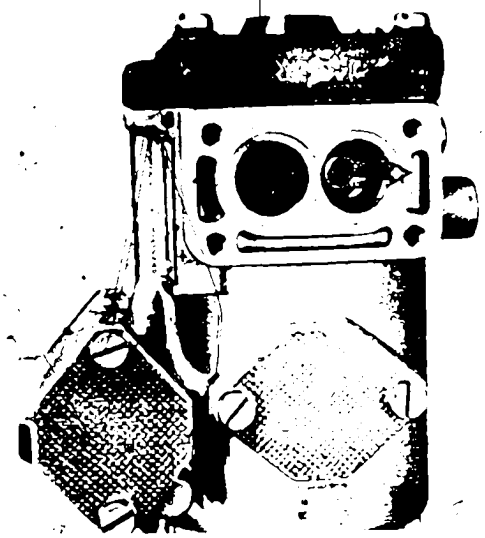
Place the collar on the shaft splines when assembling (only possible in one position due to "lost tooth").
Stick one end of the spring in the small hole of the shaft, the other in the small hole in the throttle. Tension the spring by turning the throttle in the direction in which the spring is wound until it is possible to push the throttle into the collar.
The splines on the collar, shaft and throttle must be dry and free of grease when making the connection.
Carefully insert the complete assembly. (Fig. 59)



59

Rotate the governor-control piston so that the notch points away from the throttle port (in direction of arrow).

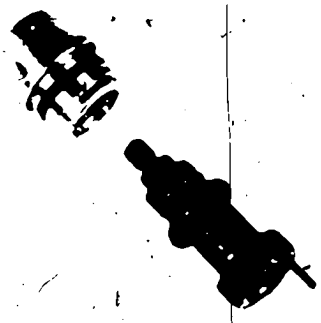
The notch on the shaft of the speed control device must point in the same direction.

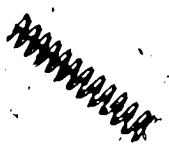


60

Fit the O-ring over the bushing of the delivery rate control device.
Slide the shaft into the bushing.
Place the disc (thickness determined on previous page) in the shaft and push the governor-control piston spring into the shaft and up against the disc.
Fit the complete delivery rate control device in the housing so that the drive pin on the shaft engages the notch in the governor-control piston.

Press the delivery rate control device and the speed control device against the hydraulic head and fit the stop plate.



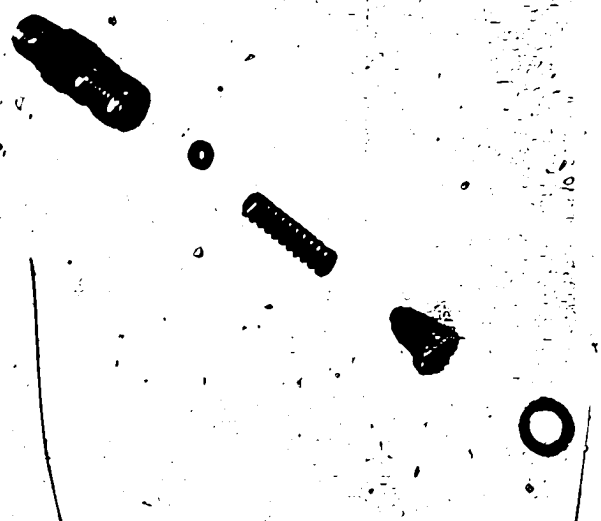


61

Install seat rings and delivery valves. Screw in delivery valve holders, with springs, and washers and fillers if necessary.

Attention

It is imperative that the delivery valve holders are tightened with exactly the torques specified on page 3.



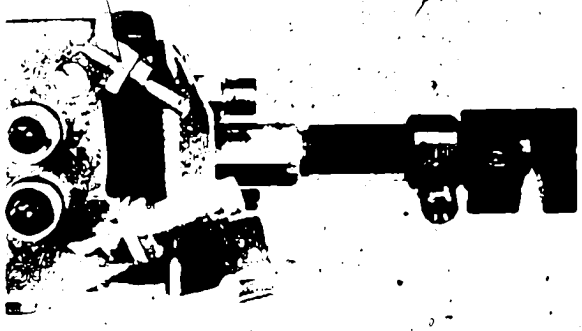
62

Attach the measuring device for setting pre-stroke and one of the two extensions (thread M 12 x 1 or M 14.5 x 2). (Fig. 63)

Fit pressure regulating valve (complete with O-rings).

Fitting position

On the left when looking at threaded end of drive shaft



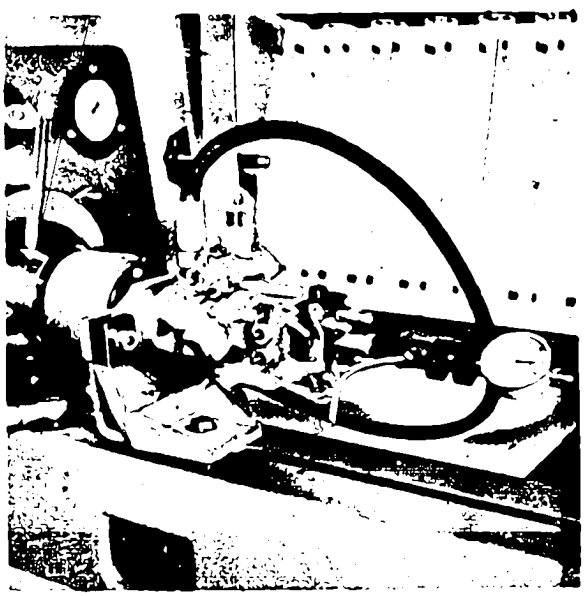
63

6. Setting the pre-stroke

Remove the pump from the clamping support and mount it in the clamping bracket of the injection pump test bench. Connect the drive coupling.
Clamp the pump on the test bench in such a way that the coupling is stressed.
To do this, fit the pump drive coupling into the backlash-free drive coupling of the test bench. Loosen clamping bracket fastening screw and pull bracket (together with pump) away from drive coupling, hold bracket in this position and tighten fastening screw.

Connect the test oil supply hose.

Fit the dial indicator pre-stroke measuring device and with the plunger at BDC, slide the dial indicator along its rod until the small hand reads 4 mm/0.158 in.



64

Switch on the test bench. Set test oil supply pressure to 0.2 bar/2.8 lb/in^2. The governor-control piston is not to be in the "stop" position.
Turn the plunger to BDC and set the large hand of the dial indicator to "0" (test oil flows out through the measuring device overflow pipe).

Turn the drive shaft in the direction of rotation of the pump until no more test oil comes out of the overflow pipe (start of pump delivery).

Read off the dial indicator. (Fig. 64)

Turn the drive shaft slowly in the opposite direction. After max. 0.02 mm/0.0008 in less stroke, test oil should once again start to drip. Repeat pre-stroke measurement.

65

Compare the value read off from the dial indicator with the pre-stroke specified in the appropriate Test-Specifications Sheet (VDT-WPP...).

Compensate for deviations from specification by placing appropriate washers under the plunger base. To do this, remove the pump from the test bench and secure it in the clamping support, remove governor-control piston and throttle, take off hydraulic head and reinstall after fitting correct washer.

If the pre-stroke is excessive, fit a thicker washer; if it is inadequate, fit a thinner washer.

If one has to choose between two different washer thicknesses, the thicker washer should be chosen. Carry out check measurement when finished. (Fig. 65)

Measure the cam plate lobe height (stroke)

When taking the measurements necessary for the fitting of the plunger return spring the height of the lobe on the cam plate is important. It is measured at this opportunity by rotating the drive shaft so that the plunger travels from BDC to TDC. This length of travel of the plunger corresponds to the lobe height and can be read on the dial indicator.

When measuring the pre-stroke of distributor-type pumps for two and three cylinder engines, please note that the cam plates from pumps from four-cylinder respectively six-cylinder engines are used. Therefore only every second upward stroke is actually a delivery stroke.

This is confirmed during pre-stroke measurement on pumps for two or three cylinder engines by the fact that the plunger travels from BDC to TDC without the flow of test oil from the overflow pipe being interrupted. Pre stroke can be measured during the next upward stroke.

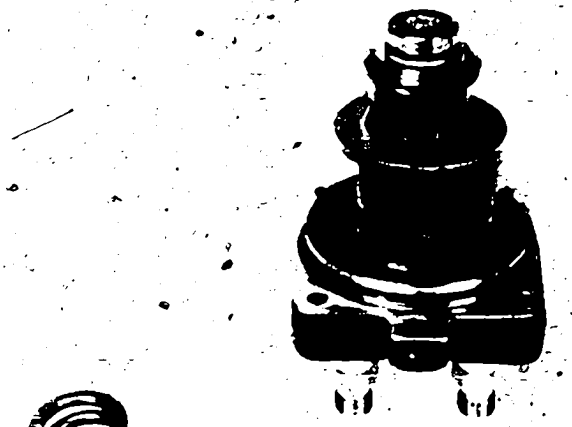
Set the timing pointer according to the data in the Test Specifications Sheet. Attach the cover. Do not forget the seal ring.
Remove the pump from the test bench and secure it in the clamping support.

Remove the pre stroke measuring device, screw in the central plug and tighten it with the prescribed torque. Use a new seal ring.

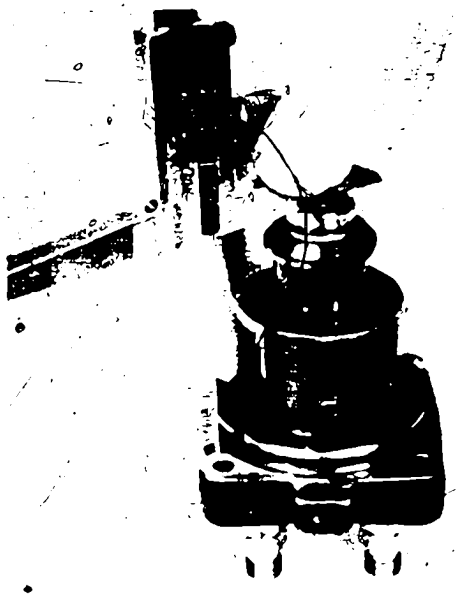
Remove the hydraulic head.

Plunger return spring fitting

Place the spacer sleeve (instead of the plunger return spring) and spring seat with washers on the hydraulic head and insert the plunger (with the appropriate washer, as determined whilst setting the pre-stroke, on the plunger base) into the hydraulic head. (Fig. 66)

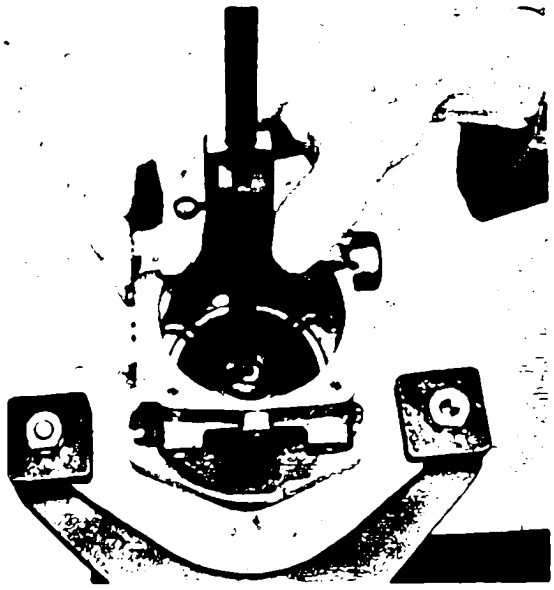


66



67

Measure from the plunger base washer to the seating surface of the hydraulic head (distance h). (Fig. 67)



68

Set the cam plate to BDC.

Measure from the seating surface of the pump housing to the center of the cam plate (seating surface of the plunger base washer), (Distance i) (Fig. 68)

Compare distance h to distance i.

General case

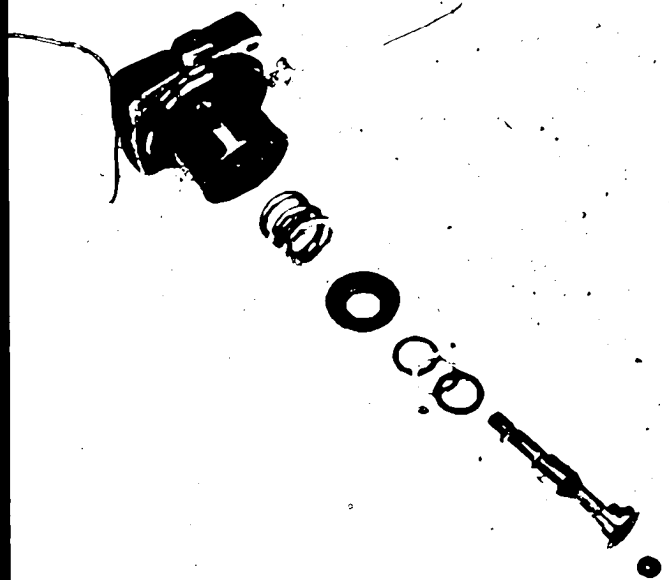
Compensate for difference between distance "h" and "i" by fitting appropriate washer(s) between plunger base and spring seat.

However, note

On cam plates with 2.5 mm/0.098 in lobe height, the length of the return spring, when fitted, is the same as that of the spacer sleeve. This applies to the general case above.

For smaller lobe heights (e.g. 2.2 mm/0.087 in) distance h must be larger than distance i by exactly the difference between the lobe height and 2.5 mm/0.098 in (e.g. 0.3 mm/0.012 in).

For larger lobe heights (e.g. 2.8 mm/0.11 in) distance h must be less than distance i by exactly the difference between the lobe height and 2.5 mm/0.098 in (e.g. 0.3 mm/0.012 in).



69

Place the washers, as determined during plunger return spring fitting, on to the plunger. Fit the washer with the lubricating grooves last so as to be next to the spring seat. Put the spring seat on the washers and the return spring on the seat.

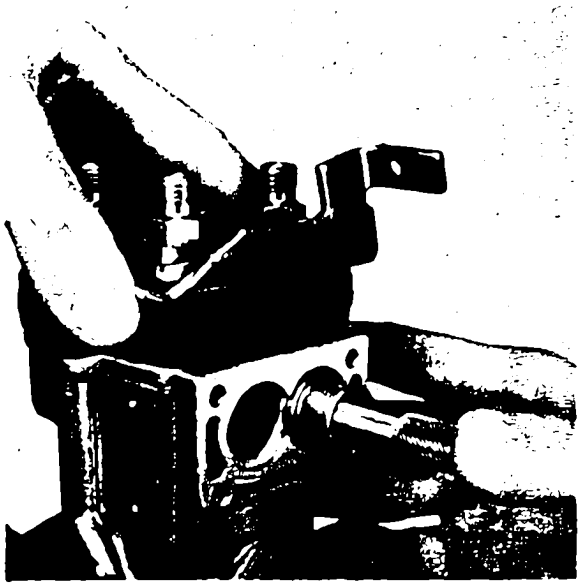
With the appropriate washer (as determined during setting of the pre-stroke) between plunger base and cam plate, fit the complete assembly on to the cam plate in such a way that the cam plate drive pin fits into the plunger base notch. (Fig. 69)

70

Make sure that the large hydraulic head seal ring is not damaged and that the small seal ring has been placed in the housing (arrow).

Without tipping it or damaging the seal rings, insert the hydraulic head slowly and carefully over the plunger and into the housing. (Fig. 70)

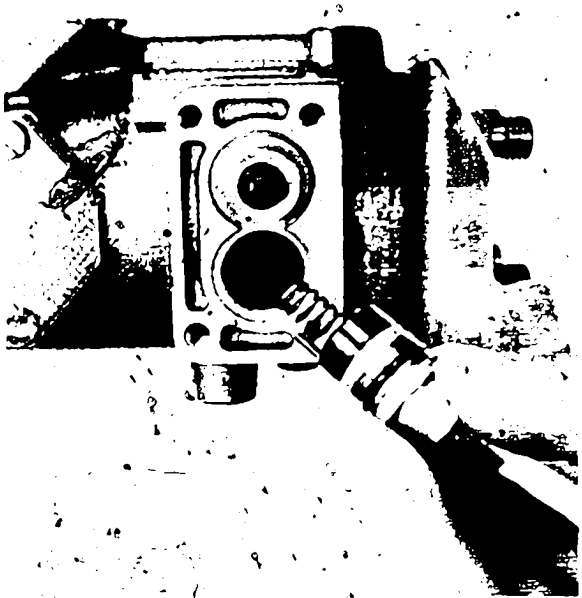
To align the hydraulic head correctly with the pump housing tighten the four fastening screws first (fit the bracket for the Bowden remote control cable, if included). Then loosen each screw one half-turn and insert the auxiliary tool (manufactured according to drawing 5, page 31 and with bushing of delivery rate control device fitted) into the governor-control piston port. Press the tool against the hydraulic head and move the latter lightly back and forth. When it is felt that the front face of the tool is flat up against the end of the control piston port in the hydraulic head, the fastening screws are to be tightened. (Fig. 71)



71

Carefully install the throttle and the complete speed control device.
Carefully install the governor-control piston.
Rotate the control piston so that the notch points away from the throttle port.

Fit the complete delivery rate control device so that the drive pin engages in the notch in the control piston.

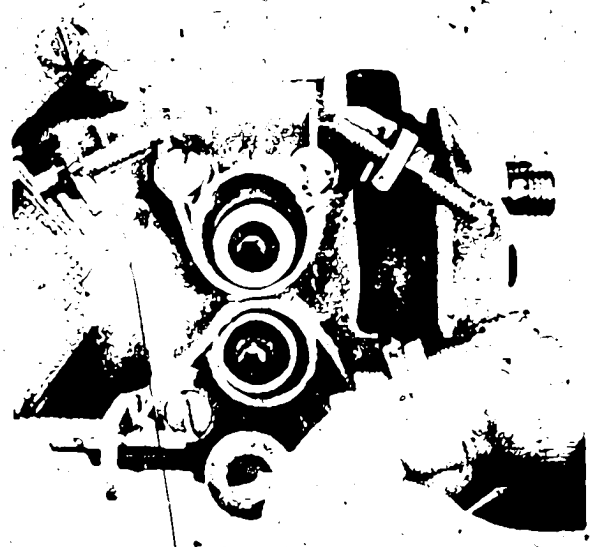


72

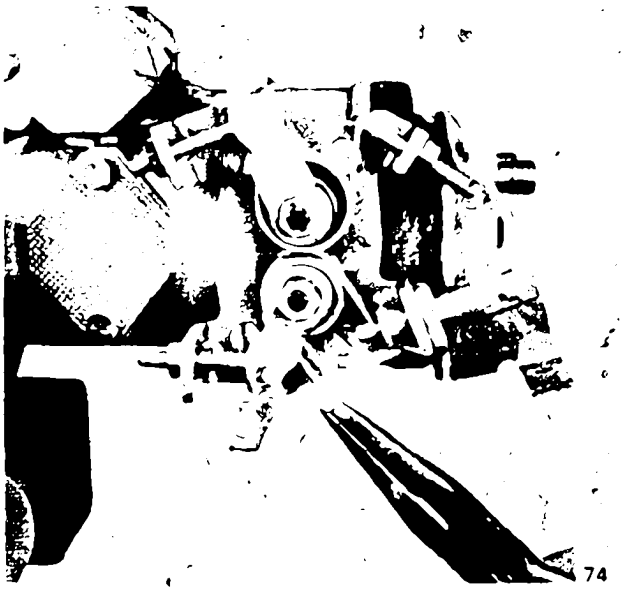
Push the delivery rate control device and the speed control device against the hydraulic head and fit the stop plate. (Fig. 72)

In the case of a throttle with collar fitting check that the play compensating spring is still engaged.

To do this fit the torsion springs and the washer under the delivery rate control lever. (Fig. 73)



73


74

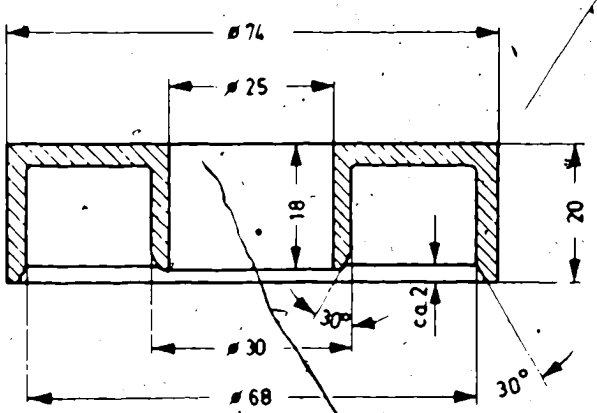
Attach the delivery control lever (shorter than the speed control lever) and speed control lever and secure them with lock washer and nut.

Move the speed control lever lightly back and forth and check to see that the throttle can be rotated without play.
If backlash is perceivable (in the splines of the shaft, the bushing and the throttle) this indicates that the play compensating spring has jumped out its seat.

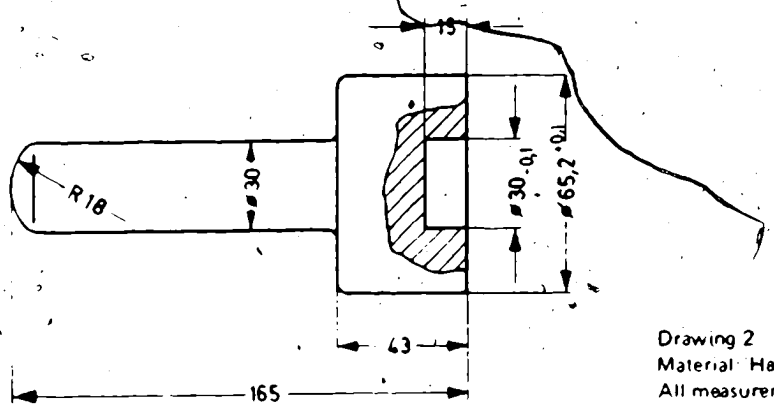
Remove the speed control device, disassemble, re-engage play compensating spring, reassemble and install again.

Engage torsion spring. (Fig. 74)

7. Auxiliary tools

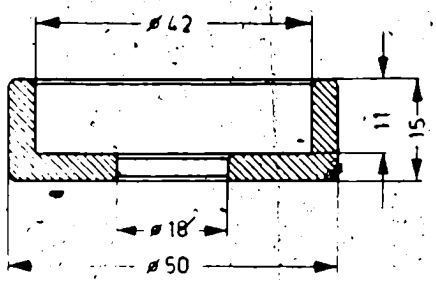


Drawing 1
Material: Hardwood or plastic
All measurements metric. ϕ = dia.
ca. = approx.

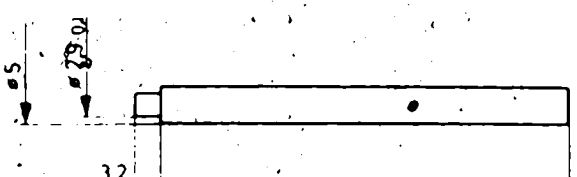


Drawing 2
Material: Hardwood or plastic
All measurements metric. ϕ = dia.

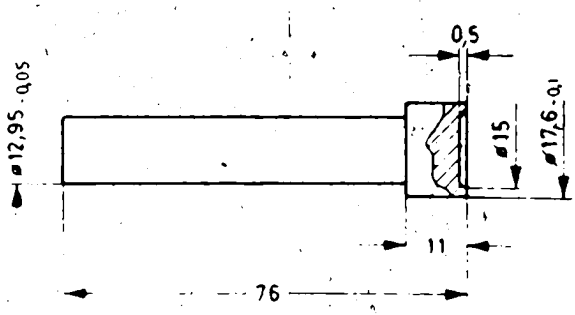
Drawing 3
Material Hardwood or plastic
All measurements metric ø = dia



Drawing 4
Material Steel
All measurements metric ø = dia



Drawing 5
Material Steel
All measurements metric ø = dia



BOSCH

REPAIR INSTRUCTIONS

46

VDT-WJP 161/4 B Suppl. 1
Ed. 1

Distributor-type Fuel Injection Pump

EP/VA . . H . . C . .

This supplement contains new developments which apply to the indicated sections of instructions VDT-WJP 161/4 B when repairing distributor-type fuel injection pumps EP/VA . H . C . .

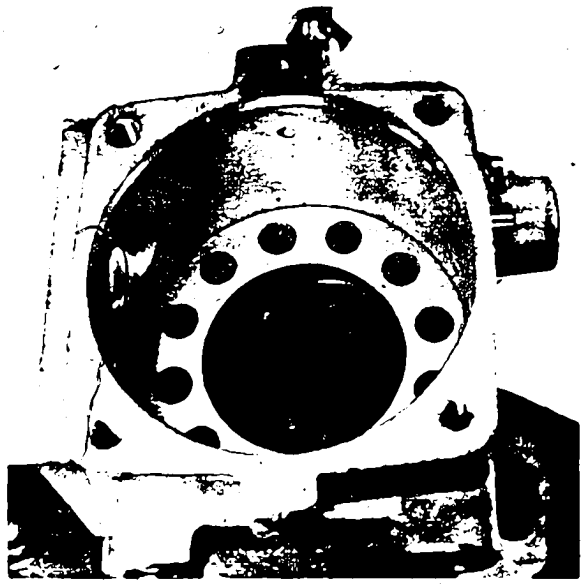
a) Sieve ring

b) Pre-stroke

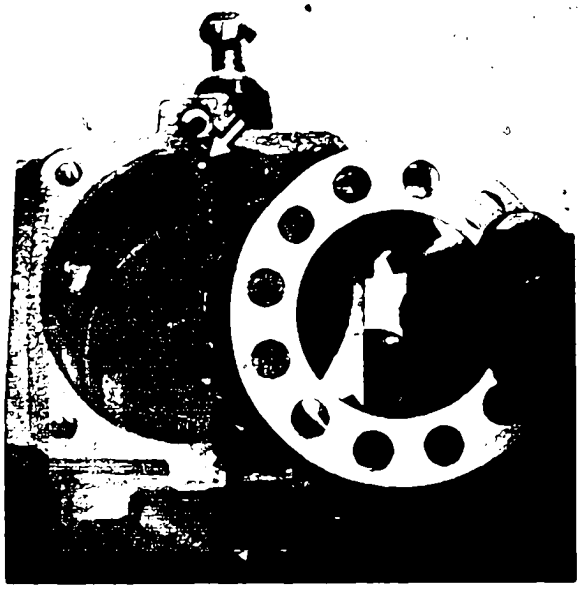
c) Removal of a tilted eccentric race

d) Electrical shut-offs

e) Correction



1



2

a) Sieve ring

Disassembly

Between Figs. 7 and 8

Text before "Take out the cam plate".

On pumps with sieve rings, remove the sieve ring and the spring washer.

"Take out the cam plate".

Assembly

Between Figs. 48 and 49

Text before "Position the washer on the cam plate so that it will fit into the plunger base recess"

Fit the spring washer on the lug in the housing and then the sieve ring on the spring washer.

Note installation position.

Fit the spring washer so that the sieve ring rests on the inner part of the spring washer and the hole side of the sieve ring is visible from the outside.

Fit the sieve ring so that the sieve holes are not covered by the spring washer tongues.

The sieve ring and spring washer are held in place by the hydraulic head, when fitted, pressing the sieve ring against the spring washer.

Blow out the vent hole (arrow).

"Position the washer..."

b) "Pre-stroke 0"

Between Figs. 50 and 51

Text before "To align the hydraulic head correctly..."

On pumps with "pre-stroke 0" (according to Test Specification Sheet), fix the hydraulic head to the pump housing with all four screws.

Mount the dial indicator 1 687 233 012 – EFAW 63 in the measuring device KDEP 1032
Using a marking-off table or similar device, pre-load the dial indicator 30 mm and set the gage at 0.

Fig. 4
A number is stamped or engraved on the hydraulic head top or on the control lever side. The figure shows both possibilities. The number 345 means 23.45 mm (specified value). If the number 335 for example, is stamped on the hydraulic head, the specified value is 23.35 mm.

Thus, the value given on the hydraulic head is without the initial number 2 and the decimal point.

Set the pump plunger at BDC (bottom dead center).

Introduce the dial indicator feeler pin into the tapped hole of the central screw plug. Place the measuring device KDEP 1032 flat on the sealing surface for the central screw plug and measure to the plunger top.

When doing so, note that the measurement is subtracted from 30 mm. Therefore, the value cannot be read directly from the gage.
Example
If the dial indicator shows a reading of 6.5 mm, the actual measured value is 23.5 mm.

The value shown in the example in Fig. 4 is 23.45 mm.

Compare the indicated value (actual value) with the specified value given on the hydraulic head. Any difference between the actual value and the specified value should be corrected by placing appropriate washers in the plunger base.

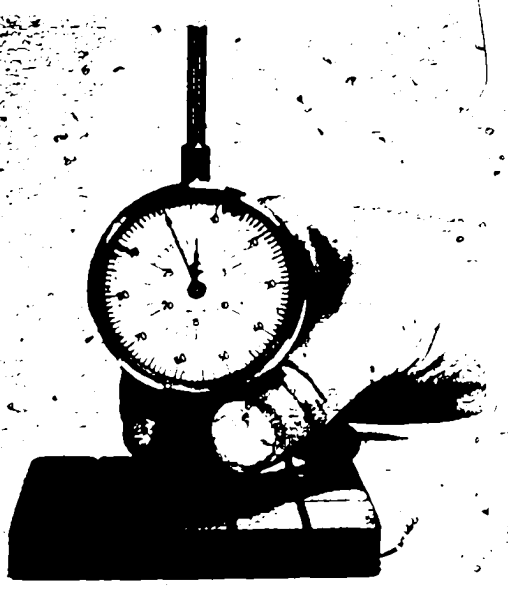
If the actual value is larger than the specified value, a thicker washer must be used; if it is smaller, a thinner washer should be fitted.

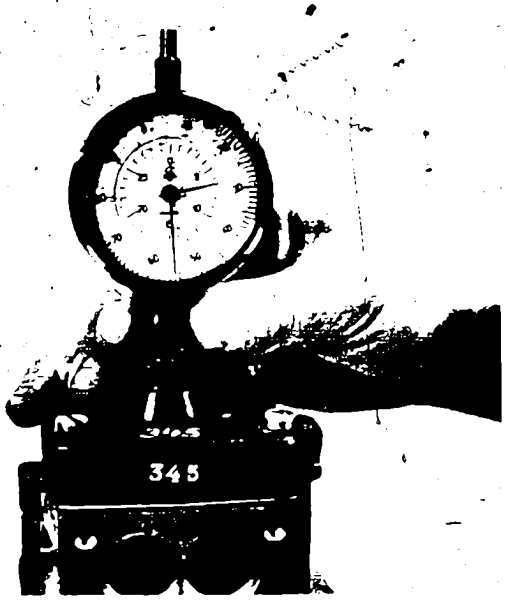
Measure the cam lift (stroke). (Important for the operation "Plunger return spring fitting" described in VDT WJP 161/4 B, p. 27)

For this purpose, screw measuring device KDEP 2940 with dial indicator 1 687 233 011 – EFAW 7 for thread M 12 x 1 and central screw plug for thread M 14.5 x 2 into the hydraulic head.
Screw device KDEP 1026 with dial indicator 1 687 233 011 – EFAW 7 into screw plug (M 14.5 x 2).

Measure and record cam lift.

Adjust the timing pointer according to Test Specification Sheet.
In pumps with "pre-stroke 0", the hydraulic pre-stroke measurement (p. 25, 26) is not carried out.



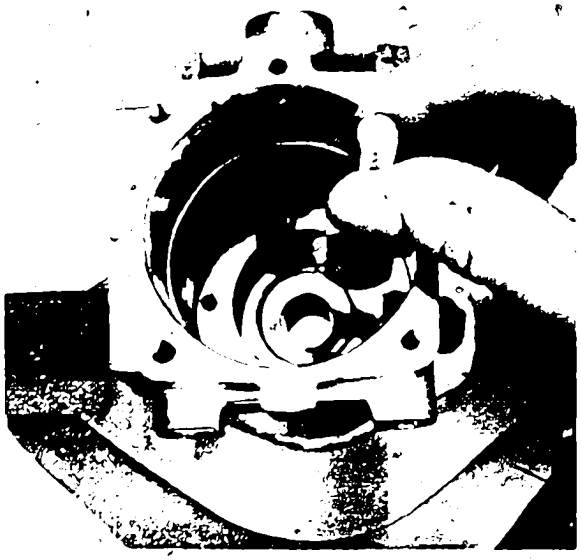


c) Removal of a tilted eccentric race

Between Figs. 21 and 22

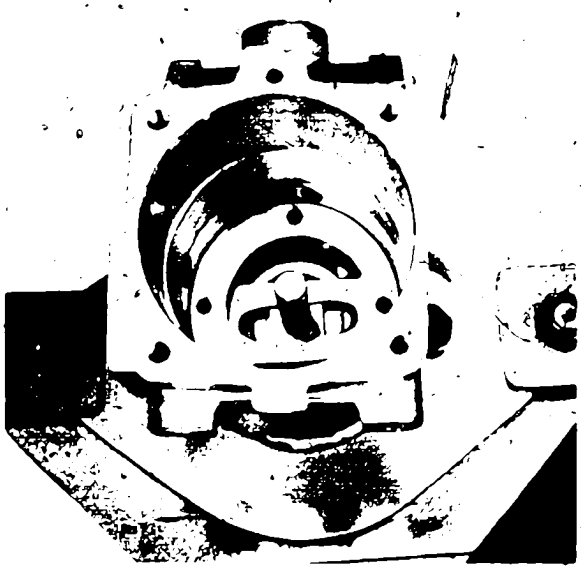
Text before "Remove the retainer"

If the eccentric race still tilts, it must be removed. For this purpose, slip a device (manufacture according to drawing 1, p. 8) under the eccentric race.



5

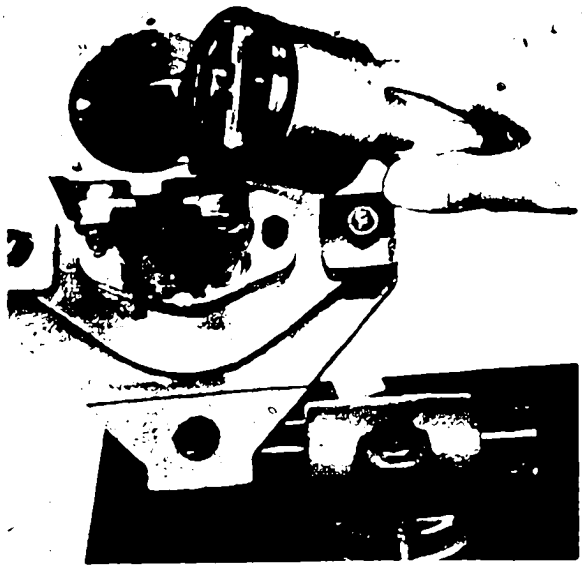
Centrally align the device (stud head in the notch of the extractor part).



6

The self-manufactured auxiliary tool (drawing 2, p. 30 in VDT WJP 161/4 B – note addition to drawing 2, p. 8 – thread M 10, 50 mm deep) should be screwed onto the stud of the device. If necessary, hold the stud with a screwdriver through the drive shaft hole in the housing. The eccentric race is now held between the extractor and the auxiliary tool.
By pushing and pulling on the auxiliary tool grip, the tilted eccentric race is loosened and can be removed together with the tools.

Note
This operation may cause shavings, which must, on all accounts, be removed.



7

d) Electrical shut-offs

Pumps with electrical shut-offs are special models which will be included in the annex to VDT-WJP 161/4 B.

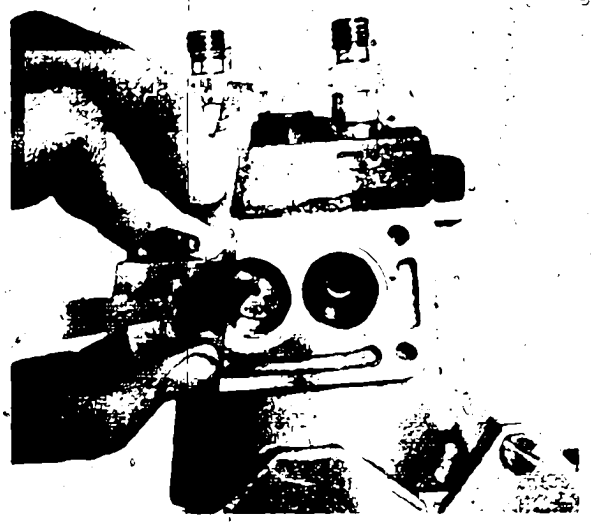
The electromagnet on pumps with electrical shut-offs is fastened to the side opposite the control lever with 4 screws.

Note:
In the magnet is a pin which is not fixed in place. Do not lose this pin.

A spring presses against the throttle.
This spring must be installed with a given initial tension.

The spring is set in a similar way to the spill piston spring (VDT WJP 161/4 B, p. 22 and 23).

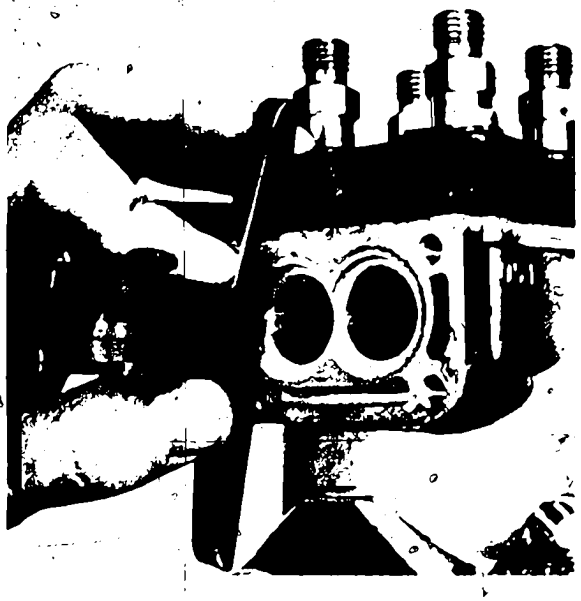
Push the throttle into the hydraulic head until it fits against the surface. Measure the distance from the stop plate on the pump housing to the spring seat of the throttle (dimension k).



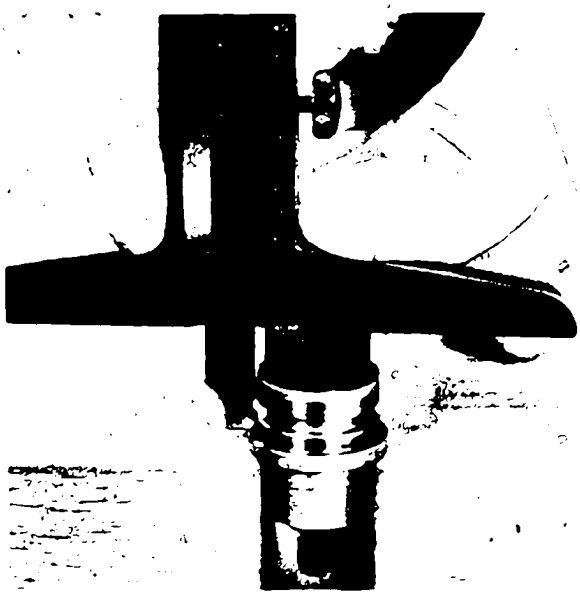
8

Measure the depth of the cylindrical countersink for the control device bushing (dimension l).

Dimension l subtracted from dimension k equals dimension m.



9



Fit the shaft of the speed control device with washer into the bushing. Measure the distance from the end face of the shaft to bushing shoulder (dimension n).

Dimension n subtracted from dimension m equals dimension o.

Fig. 11

Measure the distance from the end face of the shaft to the spring seat in the shaft with a slide caliper rule (dimension p). There should be no washer in the shaft.

Note

A center is located in the shaft hole. Do not measure into the center.

Dimension p plus dimension o equals dimension q.

Dimension VI (see Test Sheet) subtracted from dimension q indicates the thickness of the washers to be used.

Example

Dimension k	23.0 mm
− Dimension l	− 2.5 mm
= Dimension m	= 20.5 mm
Dimension m	20.5 mm
− Dimension n	− 16.9 mm
= Dimension o	= 3.6 mm
Dimension o	3.6 mm
+ Dimension p	+ 9.6 mm
= Dimension q	= 13.2 mm
Dimension q	13.2 mm
− Dimension VI (see Test Sheet)	− 12.4 mm
= Washer thickness	= 0.8 mm

All other operations in repairing pumps with electrical shut-offs are the same as described in VDT-WJP 161/4 B.

Test instructions

The electromagnet must be switched on while testing pumps with electrical shut-offs, i.e. the voltage indicated in the Test Sheet must be applied.

Testing the magnet

The magnet must pull in at the cut-in voltage indicated in the Test Sheet.

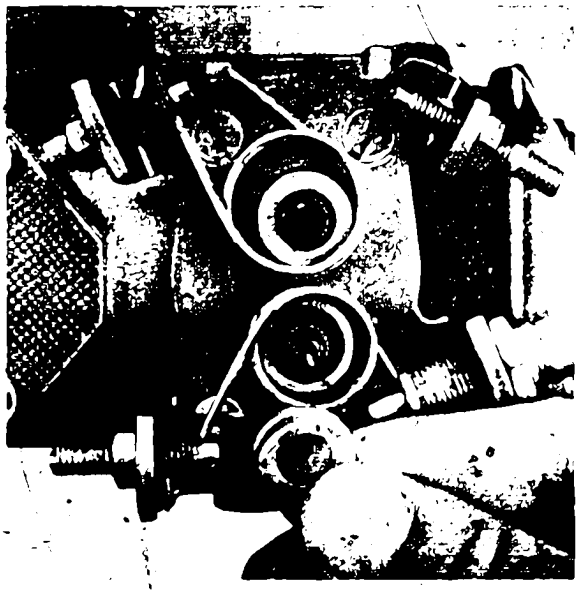
D27

e) Correction

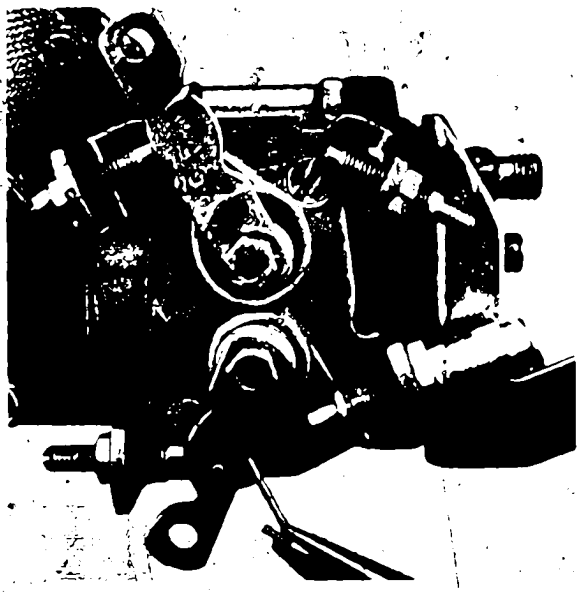
The torsion spring for the speed control device shown in the figures in instructions VDT-WJP 161/4 B was inadvertently shown in the wrong location.

The spring must be engaged as shown in Figs. 12 and 13 of this supplement.

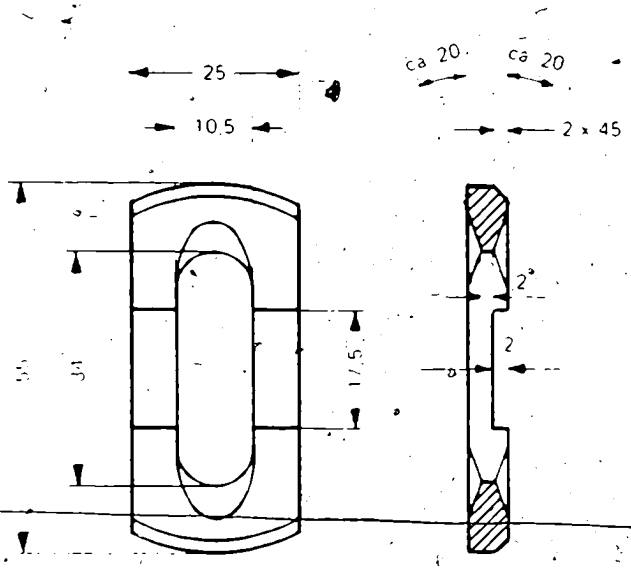
Please take note of this correction.



12

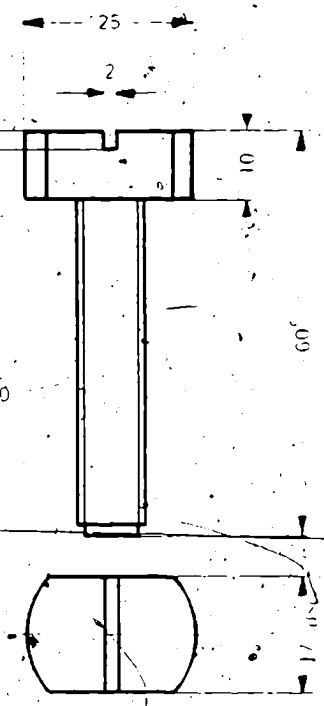


13

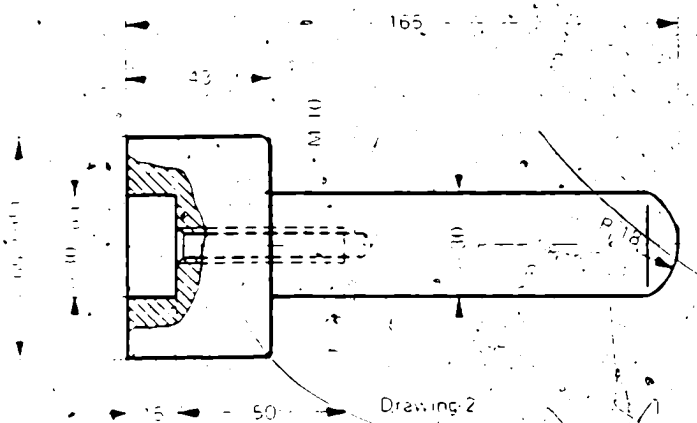


Extractor

Drawing 1
Material: Steel



Stud



Drawing 2
Material: Hardwood or aluminum

ca = approx
dia

Robert Bosch GmbH · Stuttgart 1 · Postfach 50 ... 5.72
... in Germany
Imprimé en Allemagne Red. Fed. par Robert Bosch GmbH Hausdruckerei

BOSCH

REPAIR INSTRUCTIONS
46
VDT-WJP 161/4 B Suppl. 2
Ed. 1

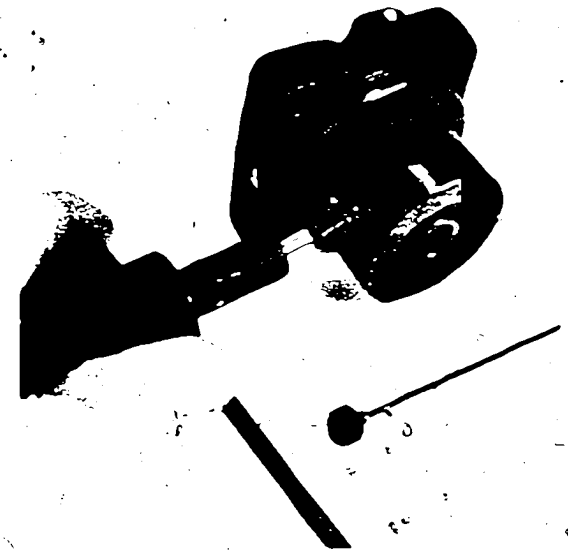
Distributor-type Fuel Injection Pump

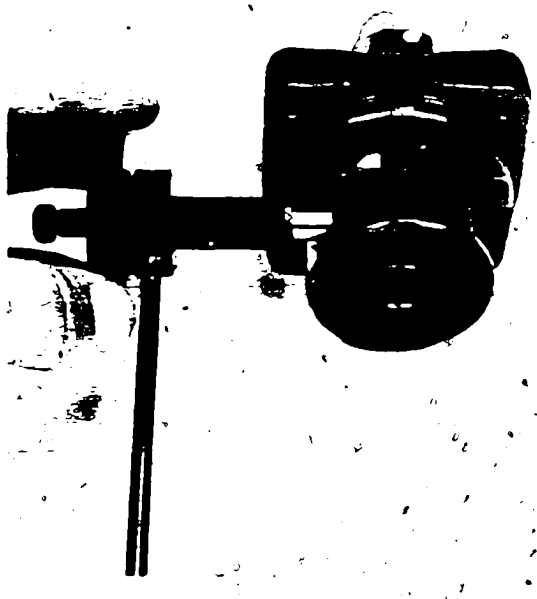
0 460 . . EP/VA . . H . . C . .

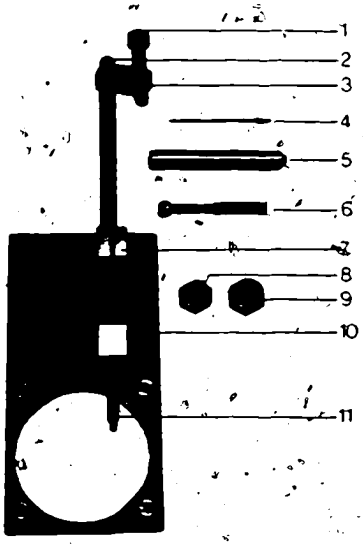
This supplement contains new developments which apply to indicated sections of Repair Instructions VDT-WJP 161/4 B and which are to be taken into account when repairing distributor-type fuel injection pump EP/VA . . H . . C . .

1. Repair of the automatic excess fuel starting device in distributor-type fuel injection pumps **without** electrical shut-off
2. Removing and fitting the retainer on the drive shaft

E2







1. Repair of the Automatic Excess Fuel Starting Device

The following information should be inserted in Section 4 ("Repairing the Hydraulic Head") of Repair Instructions WJP 161/4 B following the description of repair of a hydraulic head with a leaky non-return valve.

Disassembly of Parts

Insert the puller, KDEP 1027 without spring pin, far enough into the clamping sleeve in the hydraulic head. (Fig. 1)

Insert the spring pin.

Withdraw the clamping sleeve by turning the hand wheel and applying counter-pressure to the holding pin.

Remove the starting piston and spring by tapping the hydraulic head against a piece of wood.
Using a punch (diameter about 4 mm), drive the plug out from the clamping sleeve side.

A stuck starting piston should also be driven out, together with the spring and the plug, from the clamping sleeve side. (Fig. 2)

Repair

Check the starting piston and bore in the hydraulic head (i.e. the starting piston contact surface) for wear. If necessary, repolish the bore using tallow so that the starting piston can move smoothly.
Wash and blow out the hydraulic head.
No repair is possible if the starting piston or the bore is badly worn.

Measure the diameter of the plug which has been removed.

See VDT-BMP 161/31 for selection of the plug size.

The replacement plug must always be one size larger than the actual dimension of the plug which has been removed.

In the following assembly procedure, and in order to measure and set the gap dimension, use the pressing and measuring device, KDEP 1037. (Fig. 3)

1 Adjusting screw
2 Clamping screw
3 Swivel arm
4 Measuring adapter
5 Pressing tool
6 Reflector bracket with reflector
7 Bracket for dial indicator
8 Hollow screw
9 Hollow screw
10 Thrust screw
11 Thrust piece

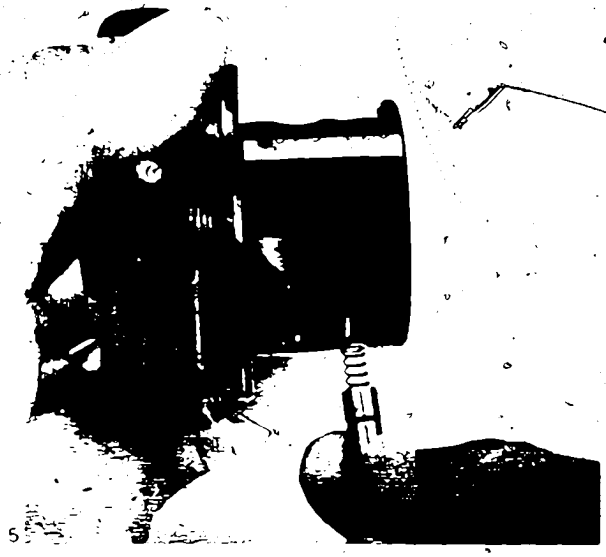
Assembly

Using the pressing tool (included with the pressing and measuring device, KDEP 1037), tap the plug in as far as the pressing tool will go (to a depth of 2.9 + 0.1 mm). When doing this, be sure that the pressing tool is not tilted to any one side. (Fig. 4)

4

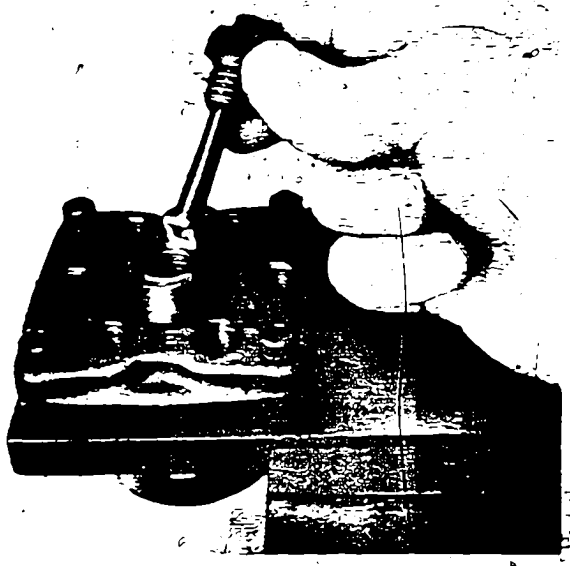
Soak the starting piston in test oil. From below, insert the spring and the starting piston into the bore in the hydraulic head and press the starting piston lightly against the plug with a suitable pin. When this is done, the spring will rest securely in its mounting in the plug and in the starting piston (Fig. 5)

With the clamping sleeve side towards the thrust piece, fasten the hydraulic head to the pressing and measuring device KDEP 1037. (Fig. 6)

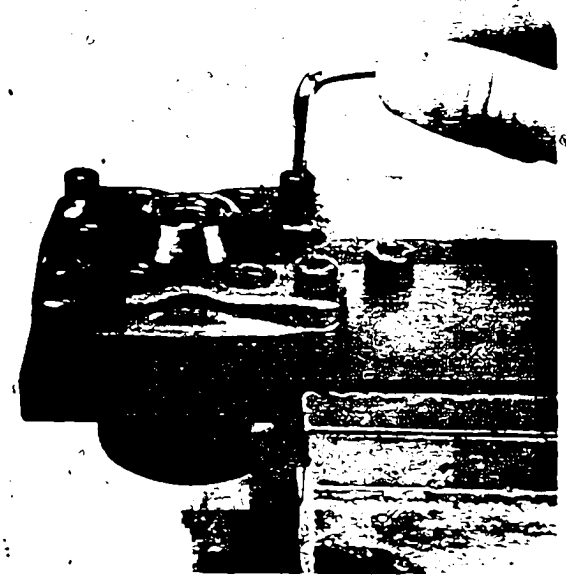


5

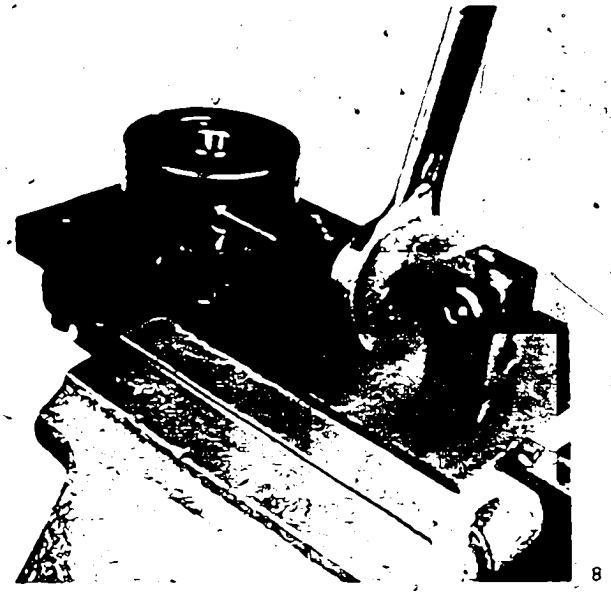
Depending on the threads in the hydraulic head, fit the reflector bracket to either the hollow screw with thread M 12 x 1 or the holoow screw with thread M 14.5 x 2 (both screws are accessories included with device KDEP 1037).
Screw the hollow screw and reflector bracket into the threaded hole in the central screw plug in the hydraulic head and tighten it hand tight. (Fig. 7)



7



6

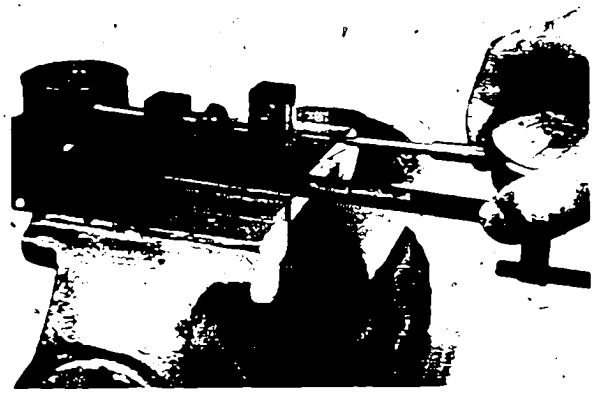


8

Place the clamping sleeve on the thrust piece and press it in place using the thrust screw. (Fig. 8)

Screw the measuring adapter (included with the pressing and measuring device, KDEP 1037) into the feeler pin of dial indicator 1 687 233 012 – EFAW 63.

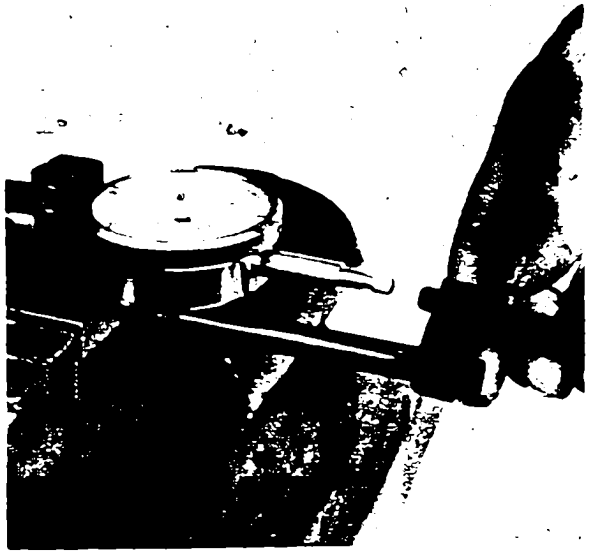
Carefully insert the feeler pin and measuring adapter into the thrust screw of device KDEP 1037. Fasten the dial indicator to the bracket. The measuring adapter must sense the position of the starting piston. (Fig. 9)



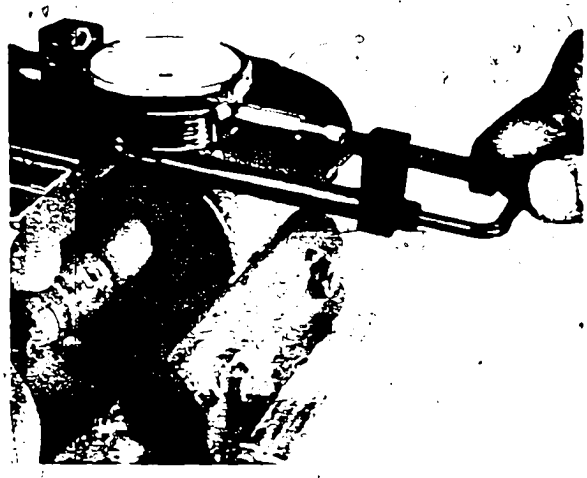
9

Swing the adjusting screw on the swivel arm so that the screw lines up with the dial indicator feeler pin. (Fig. 10)

Tighten the clamping screw at the pivot point of the swivel arm. (Fig. 11)



10



11

Measuring and Ajusting the Gap Dimension

(= 0.2 ± 0.01 mm, possible deviations are listed in the Prufblatt (Test Specifications Sheet) as dimension VII)

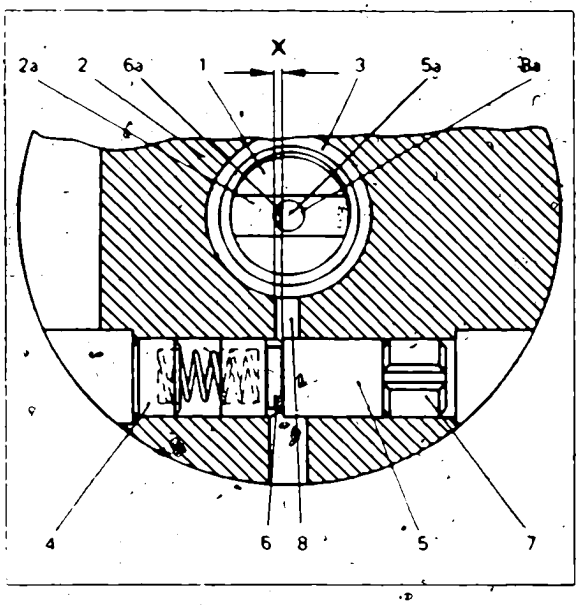
The gap dimension specifies the size of the gap (x) between the wall of the bore and the starting piston helix. (Fig. 12)

X gap dimension to be adjusted
1 Reflector
2 Hydraulic head
2a Reflected image of annular groove in hydraulic head
3 Bore for starting piston
4 Plug
5 Starting piston
5a Reflected image of starting piston
6 Annular groove in starting piston
6a Reflected image of annular groove in starting piston
7 Clamping sleeve
8 Bore (a)
8a Reflected image of bore (a)

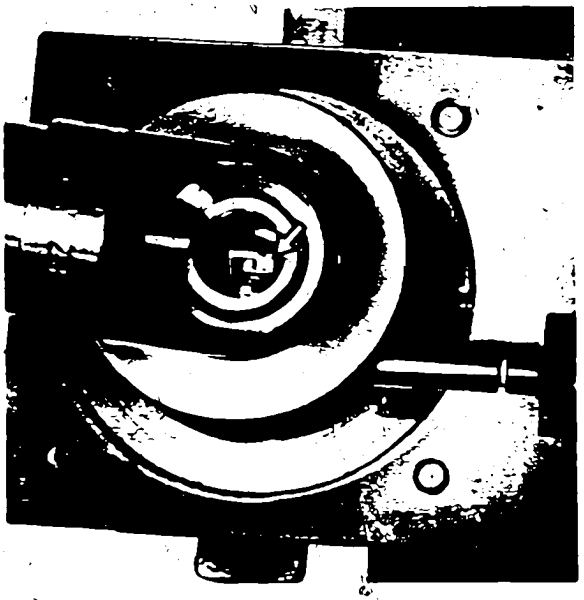
Align the reflector (see arrow) by turning the hex socket head cap screw on the reflector bracket so that the bore in the annular groove in the hydraulic head is well illuminated with the illuminated magnifying glass, 0 681 469 002 – EFAW 25 B, and can be easily viewed. (Fig. 13)

By turning the adjusting screw inward (transmitting the force through the dial indicator feeler pin and the measuring adapter), press the starting piston against the spring until the annular groove in the starting piston is seen, using the reflector and the illuminated magnifying glass, to be positioned in the bore in the hydraulic head. The annular groove stands out visibly against the polished surface of the piston. (Fig. 14)

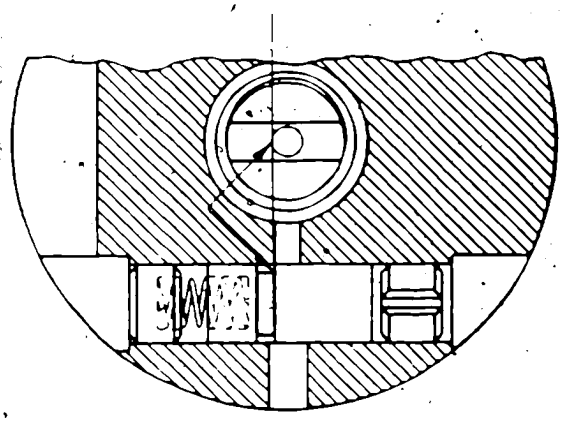
Continue to turn the adjusting screw slowly inward until the annular groove can no longer be seen, that is, until the starting piston helix just covers the bore (see arrow). In order to recognize this position of the startin piston accurately, illuminate the left wall of the bore. Correct the position of the reflector if necessary. Set the dial indicator to zero. In order to check this setting, turn the adjusting screw back and repeat the zero point adjustment procedure as described above. (Fig. 15)

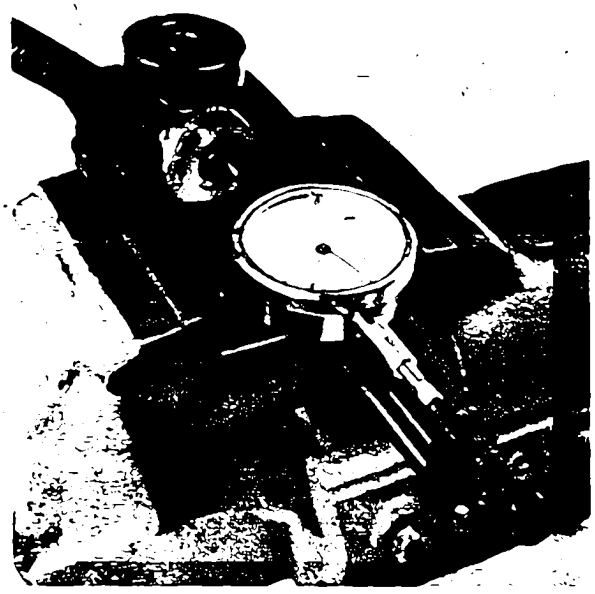


12


13


14

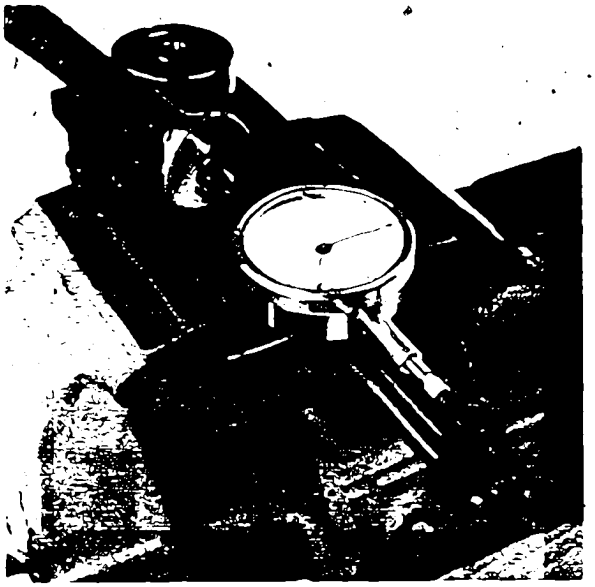

15



16

Without changing the zero point setting of the dial indicator, back the adjusting screw off about 0.4 mm (= gap dimension + approx. 0.2 mm).

Press the clamping sleeve inward until it touches the starting piston (recognizable by the deflection of the indicator needle). (Fig. 16)



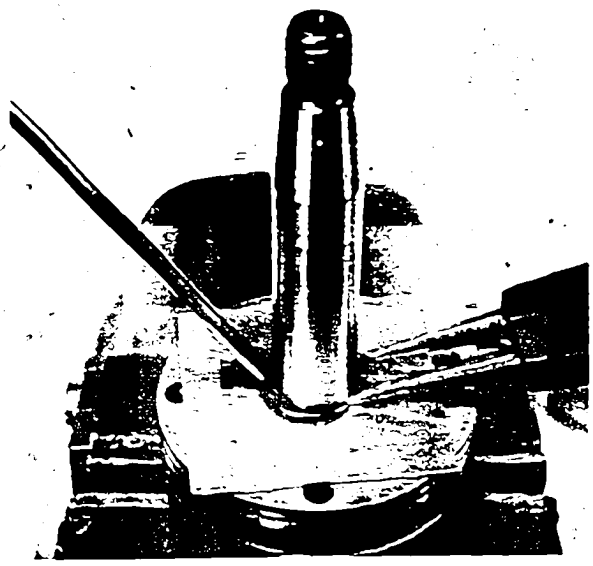
17

Press the clamping sleeve farther inward until the reading on the dial corresponds to the prescribed gap dimension.

Important:
When reading the dial, the thrust screw must not be under any load, i.e., it must be turned back. (Fig. 17)

Swing the adjusting screw with the swivel arm away from the end of the dial indicator feeler pin, detach the indicator, turn the thrust screw all the way back, remove the reflector bracket from the hydraulic head, and remove the hydraulic head from the pressing and measuring device, KDEP 1037.

Check the operation of the automatic excess fuel starting device which has just been repaired by subjecting it to the normal tests prescribed for distributor type fuel injection pumps.



18

2. Removing and Fitting the Retainer on the Drive Shaft

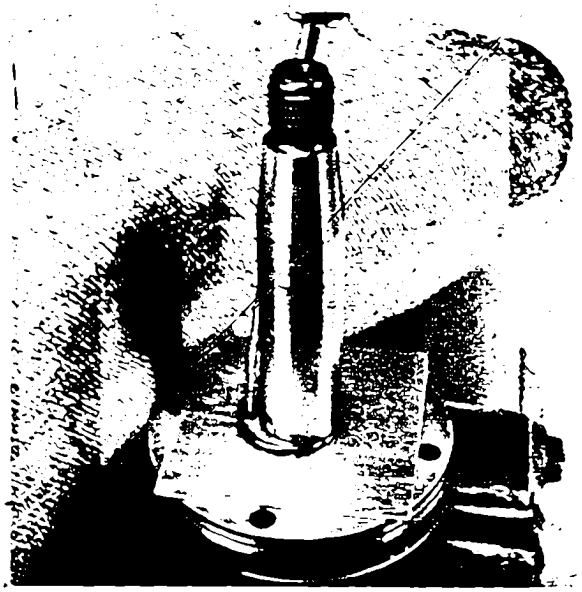
Removal

These instructions should be inserted between Figs. 21 and 22 in VDT WJP 161/4 B, i.e., before the text which starts, "Remove the eccentric race."

Clamp the drive shaft in the vise with the drive members (use protective jaws).
Slide protective sheet (manufacture locally according to Sketch No. 1) between the fuel supply pump impeller and the retainer.
Spread the retainer with pliers and force the end of a screwdriver between the retainer and the drive shaft. It is useful to grind the tips of the pliers so that they match the ends of the retainer. (Fig. 18)

Press the retainer off the drive shaft using the screwdriver.

Important note:
In order to avoid the danger of an accident, the retainer should be allowed to jump off the drive shaft only against a rag that is held as close to it as possible. (Fig. 19)

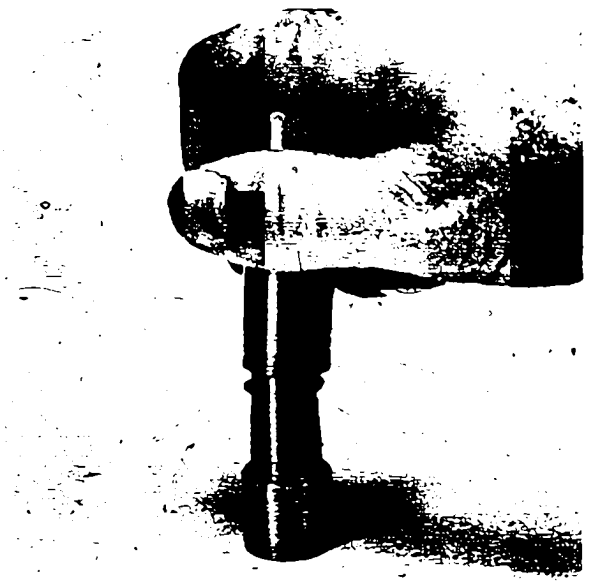

19

Fitting

These instructions should be inserted between Figs. 35 and 36 in VDT-WJP 161/4 B, i.e., before the text which starts "The two holes lying opposite one another...".

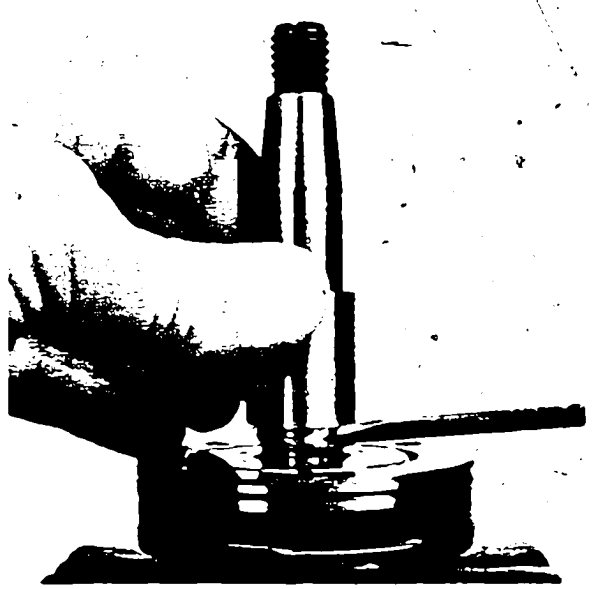
Use the tools manufactured locally according to Sketch No. 2, when fitting.

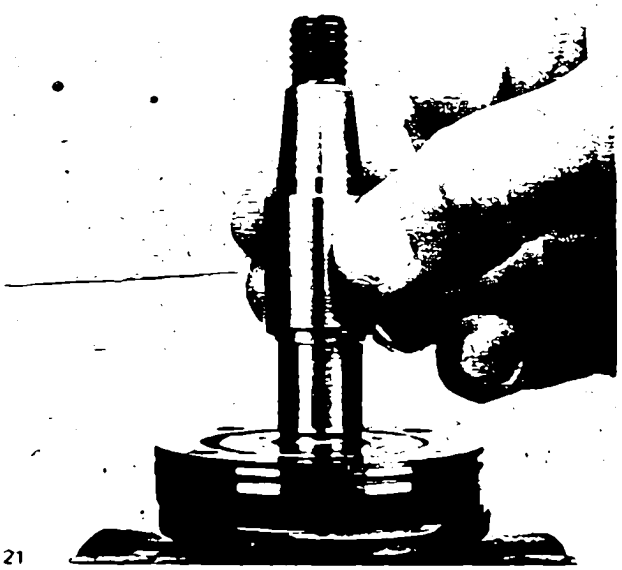
Press the retainer over the cone onto the sleeve. (Fig. 20)


20

Slide the sleeve with the retainer onto the drive shaft. (Fig. 21)

Using a screwdriver, press the retainer off the sleeve and let it jump into the notch in the drive shaft. (Fig. 22)

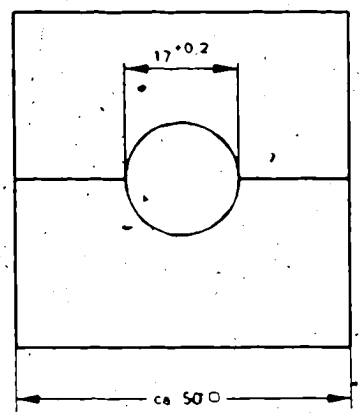

22


21

Special tool

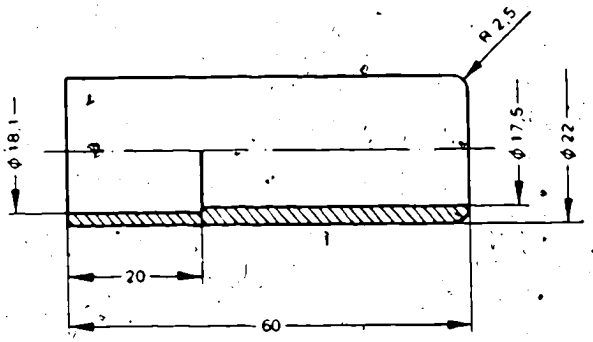
Protective sheet
Sketch No 1

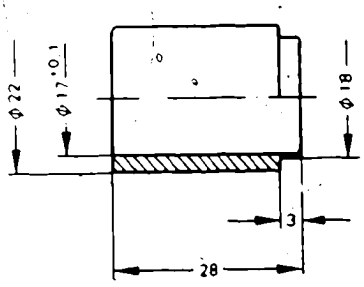
Material Al
1 mm thick

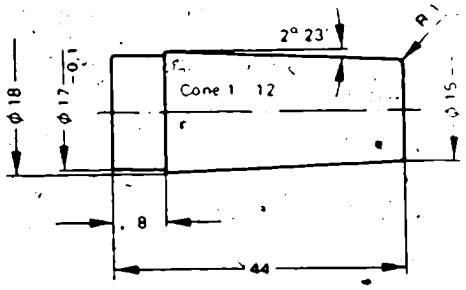


Assembly tools
Sketch No 2

Material 9 S 20
Casehardened







ca = approx.
ϕ = dia

Robert Bosch GmbH · Stuttgart 1 · Postfach 50
Printed in Germany
Imprimé en Allemagne Rép. Féd. par Robert Bosch GmbH Hausdruckerei

BOSCH

REPAIR INSTRUCTIONS

46

VDT-WJP 161/4 B Suppl. 3
Ed. 1

Distributor-Type Fuel Injection Pump

0 460 . . EP/VA . . H . . C . .

This supplement describes the simplified method of measuring the spring chambers of the governor-control piston spring and the electrical shut-off spring.

1. Measuring the governor-control piston spring chamber.

2. Measuring the electrical shut-off spring chamber.

1. Measuring the governor-control piston spring chamber

These instructions replace Figs. 54 to 57 and the associated text in VDT-WJP 161/4 B.

The remarks associated with Fig. 54 from "Setting the governor-control piston spring." through "Push the control piston up against the mechanical stop." continue to apply.

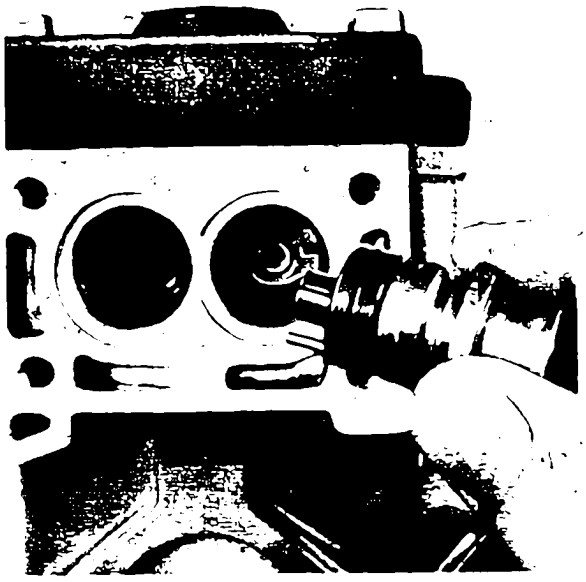
In the following measurement procedure the local manufacture tool (Drawing 1) is used.
(When making the tool be sure that the sliding parts are close fitted so that they cannot shift when the overall length of the tool is measured.)

Initially, do not fit O rings on the shaft and on the bushing of the delivery rate control device.
There should be no disc in the shaft.

Insert the shaft into the bushing.
Note the washer between the shaft and the bushing.

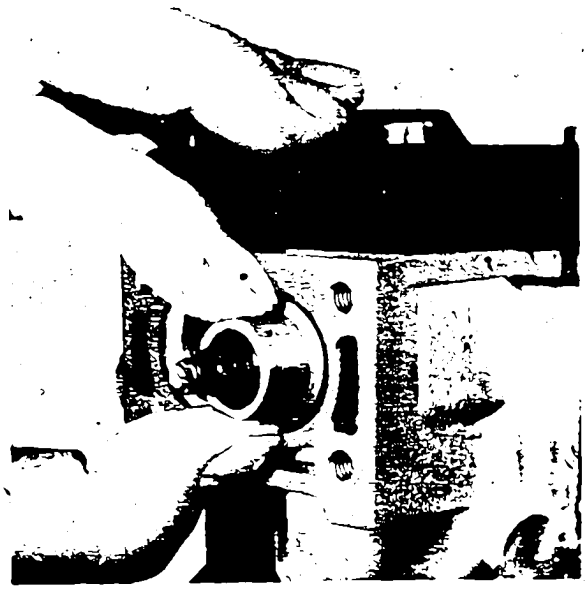
Set the tool to an overall length of about 2 mm longer than dimension V given in the Test Specifications Sheet.

Insert the tool instead of the governor-control piston spring into the shaft.



1

Insert the bushing, shaft, and tool, with the slotted bushing forward, into the delivery rate control device port.



2

Press on, the bushing against the hydraulic head and control piston, which is resting against the mechanical stop, until the shoulder of the bushing rests against the pump housing.

Pressing on the shaft will result in an incorrect measurement.

Note
The drive pin on the shaft must not press against the control piston.

Remove the bushing, shaft, and tool.

Remove the tool from the shaft and measure its length.

Compare the dimension measured and the specified dimension (dimension V), and compensate for the difference with suitable discs.

Place O rings on the shaft (with assembling sleeve) and on the delivery rate control device bushing.

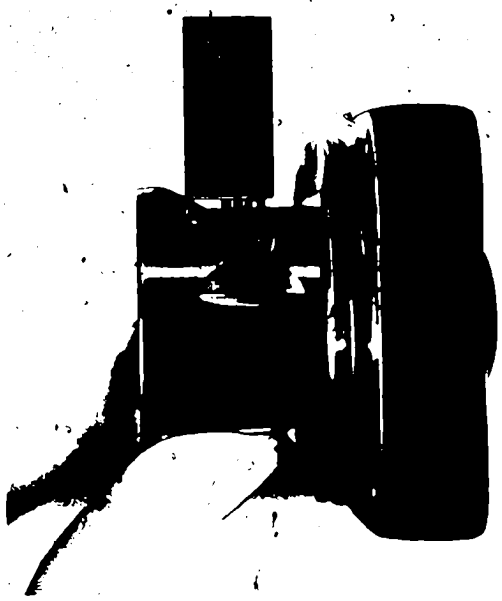
3

2. Measuring the electrical shut-off spring chamber

These instructions replace Figs. 8 to 11 and the associated text in VDT WJP 161 4 B, Supplement 1.

The introductory remarks in Section d) "Electrical Shut offs" from the beginning of the section through "This spring must be installed with a given initial tension" and the concluding remarks from "All other operations" continue to apply.

In the following measurement procedure the local manufacture tool (Drawing 2) and measuring device KDEP 1023 with spring tester KDEP 1024 are used. (When making the tool be sure that the sliding parts are close fitted so that they cannot shift when the overall length of the tool is measured).



4

Measure the length of the shut off stroke at the hydraulic head with a depth gauge. Press the throttle in to its rest position for this measurement. The throttle projects out from the hydraulic head by the length of the shut off stroke.

E12

Initially, do not fit O-rings on the shaft and on the bushing of the speed control device.
There should be no disc in the shaft.

Insert the shaft into the bushing.
Note the washer between the shaft and the bushing.

Insert the tool, with the slotted bushing forward, into the shaft.

Set the tool to an overall length so that it is at the same height as the drive pin.

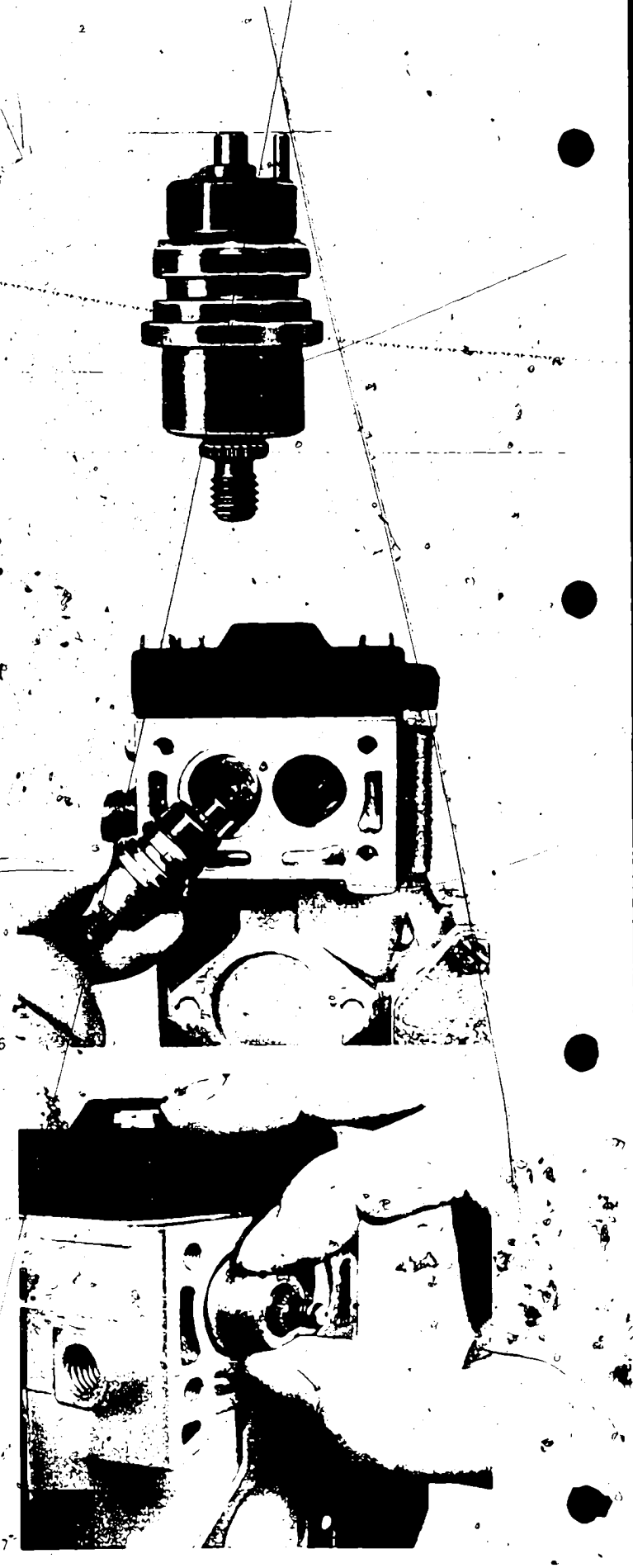
Press the throttle all the way into the hydraulic head.

Insert the bushing, shaft, and tool into the speed control device port.

Be sure that the drive pin on the shaft engages the drive notch in the throttle.

Press only the bushing against the hydraulic head until the shoulder of the bushing rests against the pump housing.

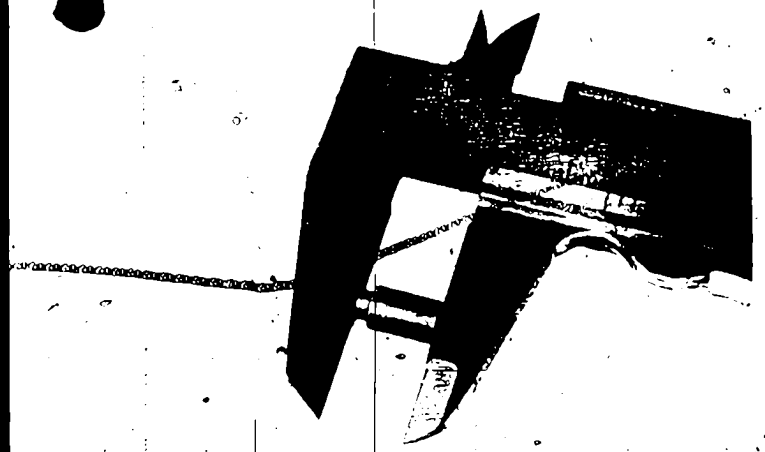
Pressing on the shaft will result in an incorrect measurement.



Remove the bushing, shaft, and tool.

Remove the tool from the shaft and measure its length.

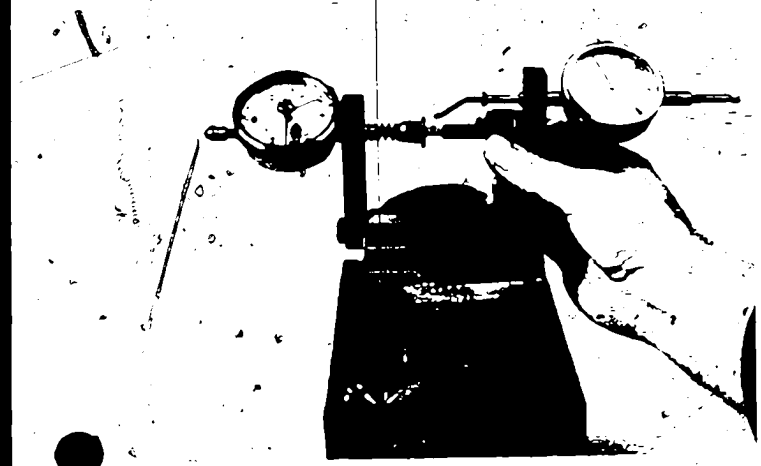
Place O-rings on the shaft (with assembling sleeve) and on the speed control device bushing.



8

With the measuring device set up the pressure spring for electrical shut off
Clamp the measuring device with the spring tester and dial indicator EFAW 64 – 1 687 233 014 – or EFAW 63 – 1 687 233 012 – in a vise.
When using dial indicator EFAW 63 detach the spring.

Place the bent measuring foot of the dial indicator up against the spring tester measuring sleeve, pre-load the indicator by 10 mm, and clamp it in that position.
Set the unloaded spring tester to "0".
Insert the pressure spring between the spring tester measuring sleeve and the adjusting pin of the measuring device.



9

Press the spring against the spring tester measuring sleeve by turning the adjusting pin until the prescribed spring pre-load given in the Test Specifications Sheet is indicated.
Tighten the lock nut of the adjusting pin.

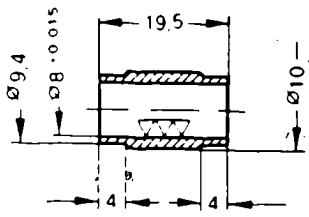
Place the dial indicator measuring foot up against the measuring sleeve of the spring tester and set the indicator to "0".
Remove the pressure spring from the measuring device.

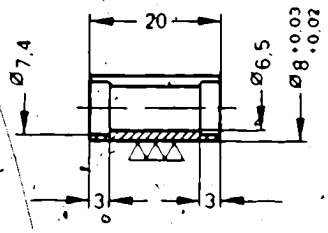
Place a try square against the adjusting pin and with the dial indicator measure the distance to the try square (see VDT-WJP 161/4 B, Edition 1, Fig. 32).

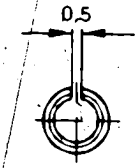
Read dial indicator.

Calculate the difference between the dimension read on the dial indicator and the dimension of the tool, and compensate for the difference with suitable washers.

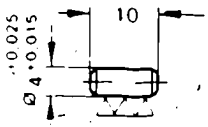
Special tools

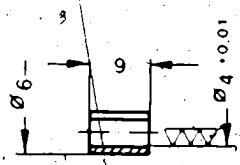


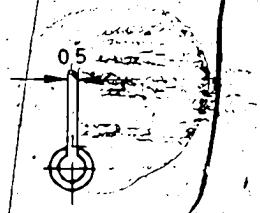




Material Steel ▽ (▽▽▽) Drawing 1







Material Steel ▽ (▽▽▽) Drawing 2

ϕ = dia

All measurements in mm

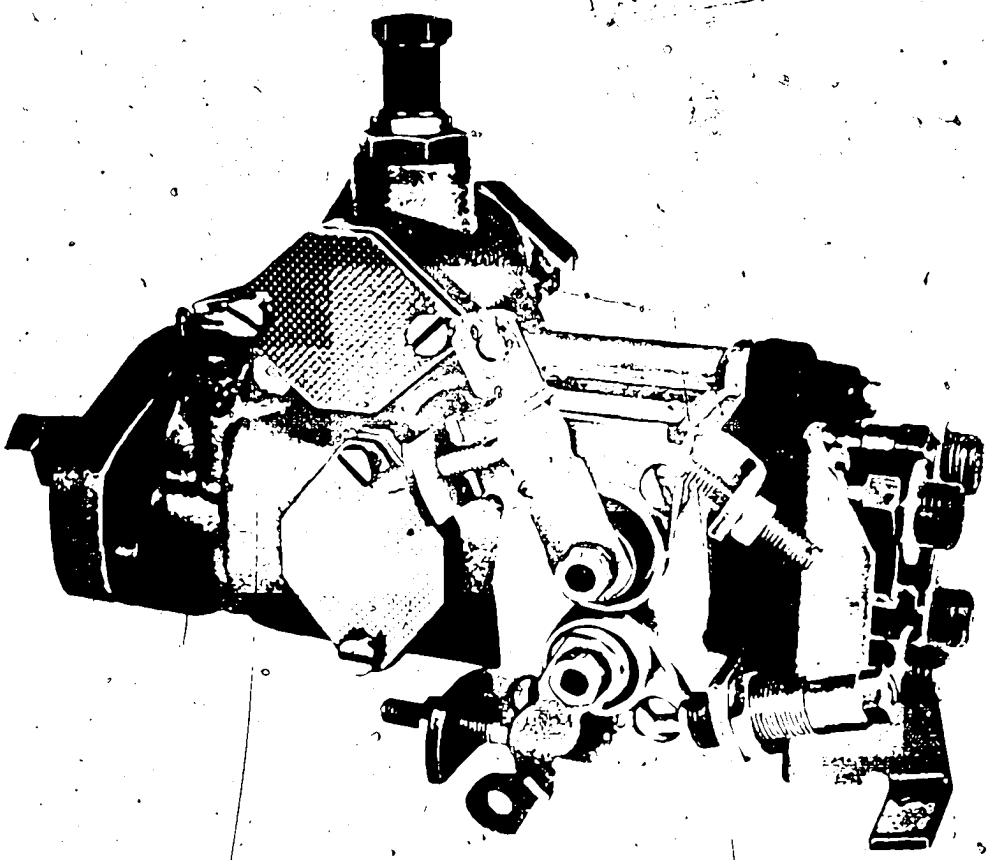
Robert Bosch GmbH (7.73)
D-7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

BOSCH
GERMANY

TEST INSTRUCTIONS
INSTRUCTIONS D'ESSAI
INSTRUCCIONES DE ENSAYO

EP

VDT-WPP 161/4 B F/SP
Ed. 1.



Distributor-type Fuel Injection Pump
Pompe distributrice d'injection
Bomba de inyección distribuidora

0 460 . . . EP/VA . . H . . C . .

E16

1. Test Equipment and Tools

Test equipment Tool	Part Number	Type Designation	Application Remarks
Flange	1 685 720 062	EFEP 157/8	Mounting of pump, 50 mm (2 in) register
Flange	1 685 720 087	EFEP 157/13	46 mm (1 13/16 in) register
Test nozzle	0 681 443 014	EFEP 182	
Nozzle holder with test nozzle	1 688 901 000	EF 8511/9 G	adjusted to >150 kgf/cm² (2130 psi), one unit adjusted to 200 kgf/cm² (2840 psi)
Fuel injection tubing (6 x 2 x 840)	1 680 750	EFEP 198..	See offer sheet VDT-AHF 295, Sheet 3 (4.69)
Testing device	1 688 130 075	EFEP 495 A	For measuring the supply pressure and supply pump pressure (pressure gauge set with fittings)
Measuring device	KDEP 1025	–	For measuring the timing device characteristics, with fitting for measurement of supply pump pressure
Puller	KDEP 1027	–	For pulling out the clamping bushings of the pressure control valve

Contents

Page		
1	1	Test Equipment and Tools
7	2	Test Conditions
7	3	Test Procedure for Readjustment
14	4	Checking
15	5	Auxiliary Tools

Sommaire

Page		
3a	1.	Appareillage et outillage d'essai
7a	2.	Conditions d'essai
7a	3.	Processus d'essai en cas de nouveau réglage
14a	4.	Vérification
15	5.	Outillage auxiliaire

Indice

Página		
3	1.	Aparatos de ensayo y herramientas
7a	2.	Condiciones de ensayo
7a	3.	Proceso de ensayo para el ajuste
14a	4.	Comprobación
15	5.	Herramientas auxiliares

BOSCH

Distributor-type fuel injection pump

TEST SPECIFICATIONS EP

VDT-WPP 001/4 B

Edition | Replacing

Special notes Test instructions VDT-WPP 181/
For pre-adjustment see overleaf

Nozzle	EFEP 182	Test oil	OI 61 v 11
Nozzle holder	EF 8511 9	Outside Germany	Shell Calibration fluid B or C
Opening pressure	150 kgf/cm² (2130 psi)	Test oil temperature	40 ± 5° C (104 + 9° F)
Fuel injection tubing	6 x 2 x 840 mm	Feed pressure	0.2 kgf/cm² (2.8 psi)

Manufacturer:

Engine model:

All test specifications apply exclusively to BOSCH fuel injection pump test stands and BOSCH test equipment.

Pre-stroke setting mm

1. CALIBRATION OF PUMP

	rev/min		Volume difference cm³
1.1 Timing piston travel		mm	
1.2 Supply pump pressure		kgf/cm² (psi)	
1.3 Full-load quantity		cm³/1000 strokes	
1.4 Low idle			
1.5 Start			
1.6 Break-away			

2. TEST SPECIFICATIONS and in brackets = (CHECK SPECIFICATIONS)

2.1 Timing device rev/min mm

2.2 Supply pump rev/min kgf/cm²

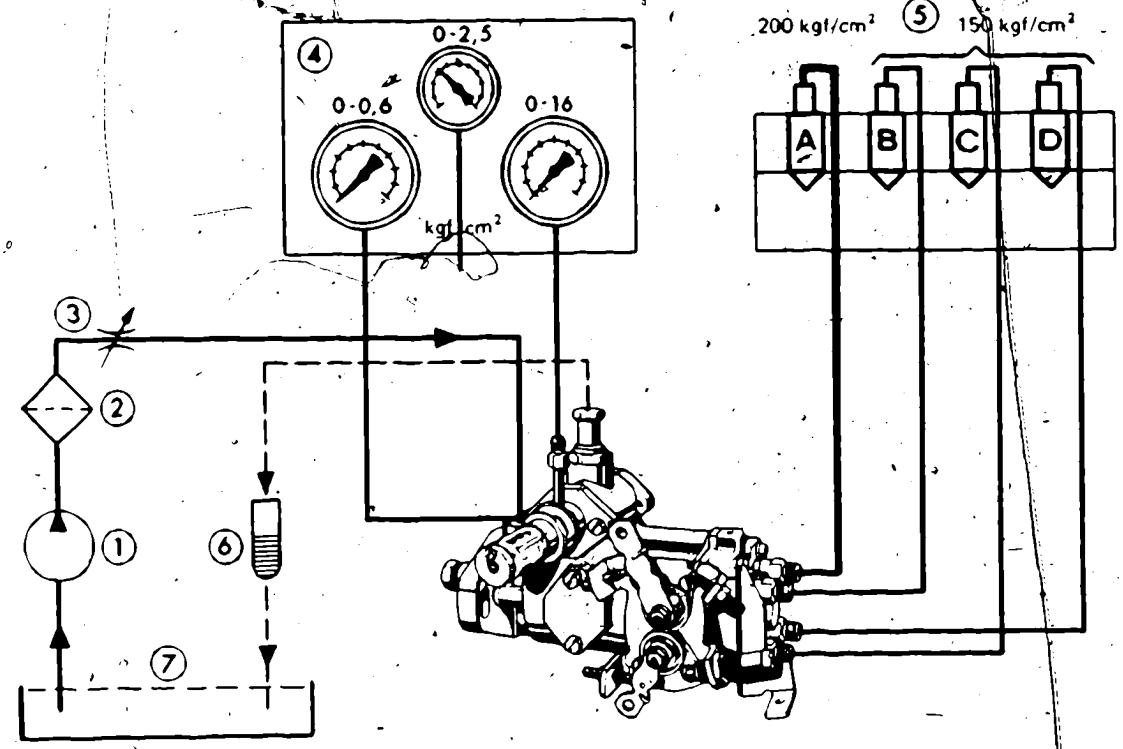
2.3 Delivery quantities

Speed control lever	Delivery-rate control lever	rev/min	cm³/1000 strokes	Overflow quantity cm³/10 sec
Max. speed stop	Full-load			
	Shut-off			
Idling stop	Full-load			

ROBERT BOSCH GMBH STUTTGART GERMANY

E18

Pipeline diagram



1 = Fuel supply pump
2 = Filter
3 = Supply pressure regulator
4 = Pressure gauge 0 – 0.6 kgf/cm² (0 – 8.5 psi) (supply pressure)
0 – 2.5 kgf/cm² (0 – 35.6 psi) (charge pressure)
0 – 16 kgf/cm² (0 – 228 psi)
(supply pump pressure)
5 = Nozzle holder with nozzles 150 kgf/cm² (2130 psi)
Nozzle holder with nozzle 200 kgf/cm² (2840 psi)
at outlet A for start quantity
6 = Graduate for the overflow quantity
7 = Test oil tank

1 = Pompe d'alimentation
2 = Filtre
3 = Régulateur de pression d'arrivée
4 = Manomètres 0 – 0.6 kgf/cm² (pression d'arrivée)
0 – 2.5 kgf/cm² (pression de charge)
0 – 16 kgf/cm² (pression d'alimentation)
5 = Porte-injecteur avec injecteurs 150 kgf/cm²
Porte-injecteur avec injecteur 200 kgf/cm²
au départ A pour débit de démarrage
6 = Eprouvette graduée pour mesurer le débit de décharge
7 = Réservoir de fluide d'essai

1 = Bomba de alimentación
2 = Filtro
3 = Regulación de la presión de entrada
4 = Manómetro 0 – 0.6 kgf/cm² (presión de entrada)
0 – 2.5 kgf/cm² (presión de carga)
0 – 16 kgf/cm² (presión de la bomba de alimentación)
5 = Portainyectores con inyectores 150 kgf/cm²
Portainyector con inyector 200 kgf/cm²
en la salida A para el caudal de arranque
6 = Vaso de medición del caudal de rebose
7 = Recipiente de aceite de ensayo

2. Test Conditions

(see Pipeline Diagram)

Test oil 01 61 v 11 is used for testing at a temperature of 40 + 5° C (104 + 9° F) and a supply pressure of 0.2 kgf/cm² (2.8 psi) at all speeds.
Outside Germany "Shell Calibration Fluid B or C" can be used.
The overflow quantity at the overflow valve is returned to the test oil tank of the test stand through plastic tubing. The oil can be collected here in a graduate for measurement of the quantity of overflow.

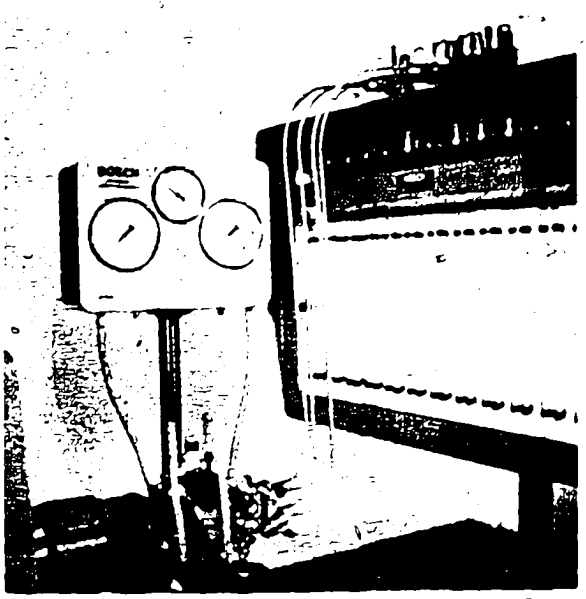
2.1 Test equipment EFEP 495 A
is required for the following measurements:

Pressure gauge 0-0.6 kgf/cm² (0-8.5 psi) for measuring the supply pressure (built-in check valve for the protection of the pressure gauge) is connected to the supply inlet (supply pump inlet).

Pressure gauge 0-16 kgf/cm² (0-228 psi) for measuring the supply pump pressure is connected to the measuring device for measurement of the timing device characteristics

2.2 Bend the fuel injection lines to the nozzle holders to permit stress-free connections. It is advisable to identify the lines with the letters stamped on the distributor head and to connect them to the nozzle holders in the sequence A, B, C, etc (see pipeline diagram).
In some pump versions it is necessary to set one nozzle to 200 kgf/cm² (2840 psi), in order to measure the start quantity, and to connect it to outlet A. This measurement is specified on the appropriate test specification sheet

1

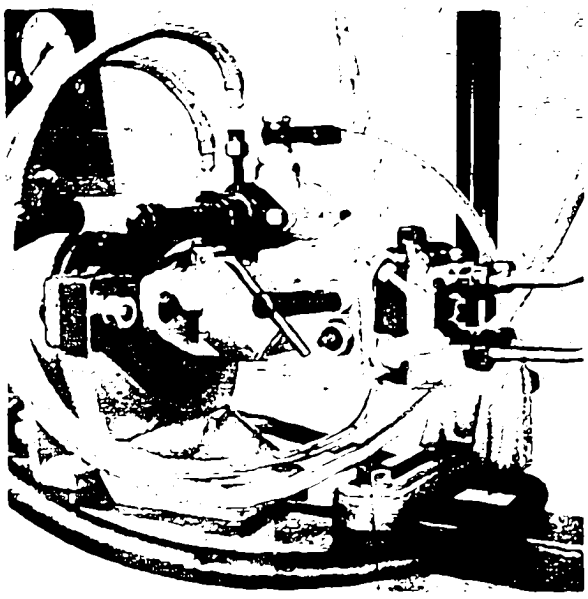


2

3. Test Procedure for Readjustment

Mount pump (overflow valve at top)
Mount complete pump on mounting bracket on the test bench so that the coupling is under a tensile stress, i.e. mount pump on mounting bracket, loosen fastening bolt of mounting bracket, attach drive coupling of the pump with play-free coupling of the test bench. Pull mounting bracket with attached pump against drive. At the same time, tighten fastening bolt. Fig 1
Connect test oil supply* and overflow tubing, fuel injection tubing with nozzle holders (150 kgf/cm² [2130 psi], if need be, one nozzle at 200 kgf/cm² [2840 psi]) and pressure gauges. Mount measuring device for measurement of timing device characteristics opposite the spring side of the timing device.

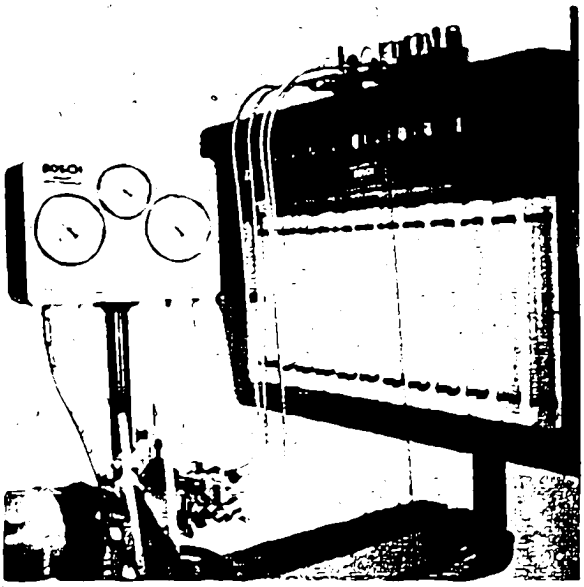
*Test oil inlet is always at the same point independent of the direction of rotation (on the R.H. side when viewed from drive end).
Remove delivery-rate control and speed control levers. Adjust supply pressure. Operate pump at about 100 rev/min and vent at the test nozzle holders. Fig 2



3

Operate pump at the highest speed given in the test specification sheet (Sect. 2.3). Fuel delivery must not be interrupted when speed is increased. Rotate throttle if this happens.

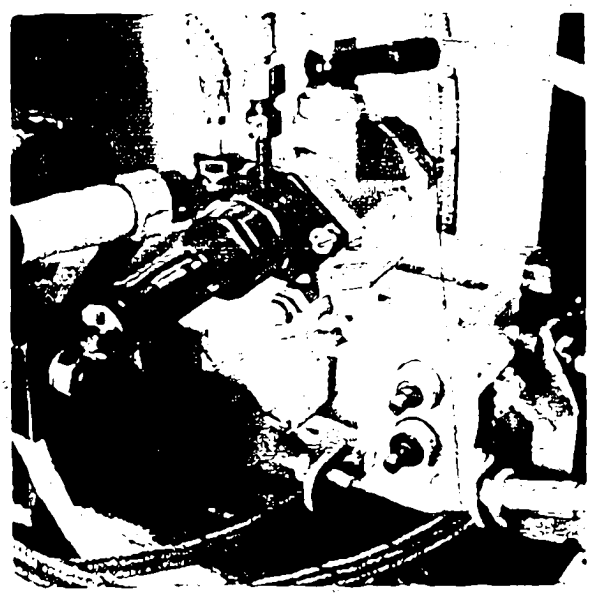
Turn throttle in the direction of idling stop until the delivery becomes noticeably smaller.



4

Breaking-in

Before making new settings, the pump must be broken in for about 20 min. Speed and quantity according to Sect. 1.3 of the test specifications.



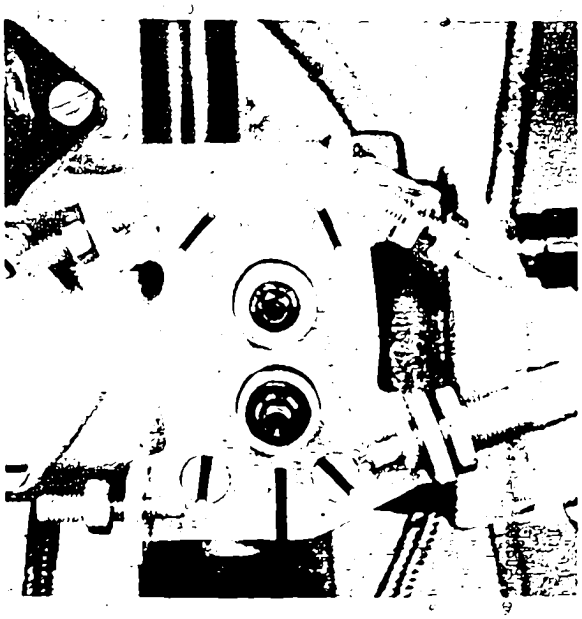
5

Adjust pump

See test specifications, Sect. 1, for calibration values.

Set timing piston travel according to 1.1 and the supply pump pressure according to 1.2.

At the specified speed, the timing piston travel and the supply pump pressure must be within the given tolerances. Setting is made on the pressure control valve.



6

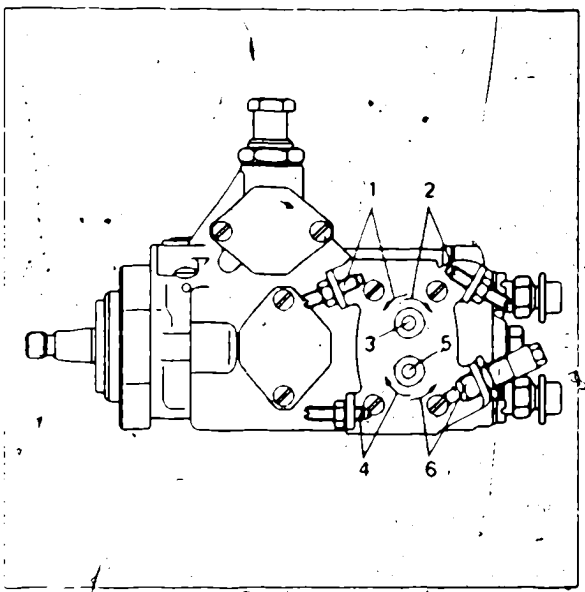
The use of the auxiliary tool (Sketch 1 on p. 13) sometimes will facilitate the following work sequence. We recommend fabrication of this tool.

Initial position of spill piston and throttle

The initial position of the spill piston is indicated when the notch points away from the throttle (see illustration).

The initial position of the throttle must be determined by turning it with the pump running (approximately idling speed) and with correctly positioned spill piston (notch pointing away from the throttle) until the correct quantity is delivered.

(If the throttle is rotated by 1/2 turn = 180° from this position, no delivery occurs).



7

The possible installation arrangements shown in Figs. 7 and 8 for the spill piston and throttle and the stops are normal.

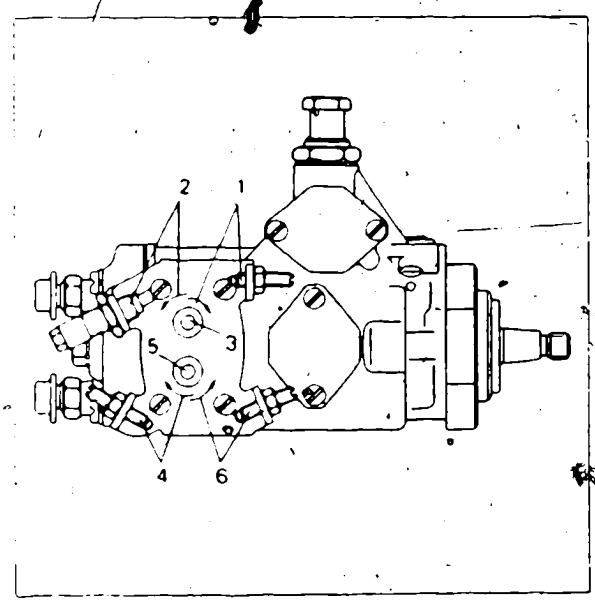
If the spill piston and throttle or the stops should be mounted elsewhere, the full-load position of the spill piston and the idling position of the throttle must be determined.

The full-load position of the spill piston is opposite the stop position.

The idling position of the throttle is opposite the maximum speed stop.

lever installation, right (viewed from drive side)

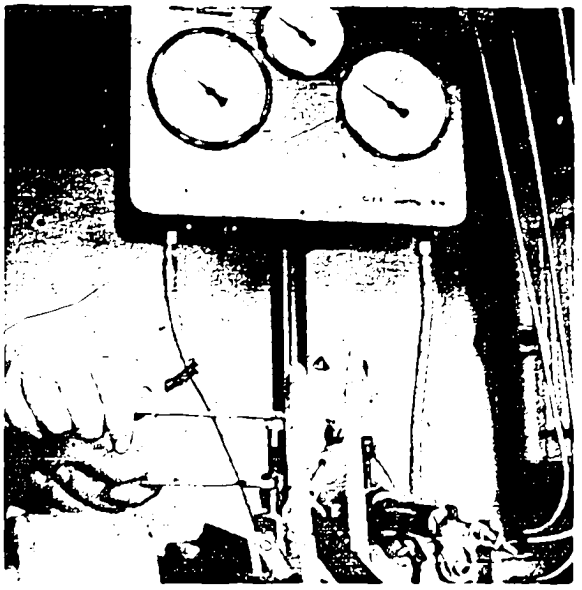
1 = direction of idling speed stop
2 = direction of maximum speed stop
3 = throttle (speed)
4 = full load stop direction
5 = spill piston (delivery rate)
6 = stop direction



8

lever installation, left (viewed from drive side)

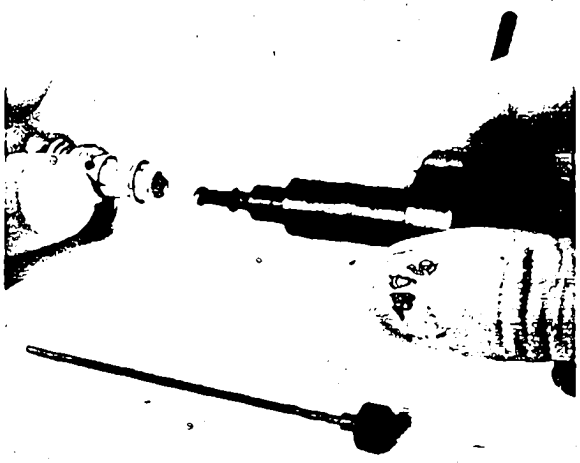
1 = full-load stop direction
2 = stop direction
3 = spill piston (delivery rate)
4 = direction of maximum speed stop
5 = throttle (speed)
6 = direction of idling speed stop



9

By depressing the plug in the pressure control valve, the supply pump pressure is increased and the timing device characteristics are advanced. The mandrel shown in Sketch 2 on p. 13 can be used. Fig. 9

After pulling out the clamping bushing with the puller, the plug can be pushed back; in this way, the pressure can be decreased and the timing piston travel can be reduced.



10

The following work step is necessary:

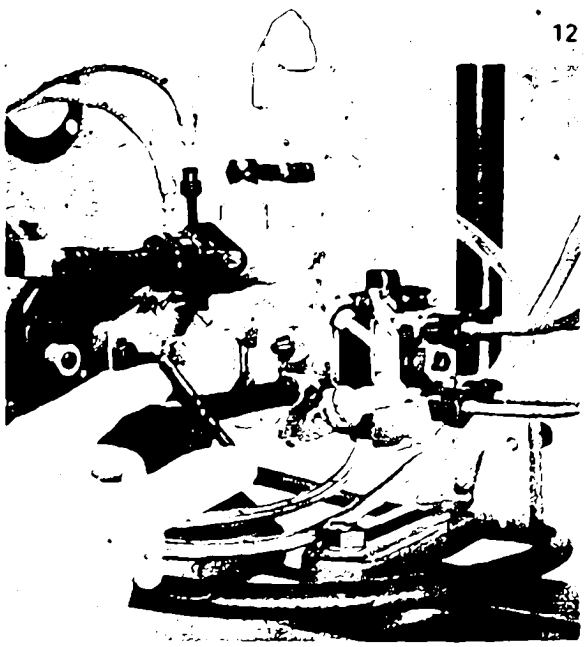
Dismount pressure control valve (= one unit). Pull out clamping bushing with puller, dismount piston and spring, and push plug outwards. Reinstall spring and piston, press in clamping bushing until flush. Reinstall pressure control valve. Fig. 10 and 11

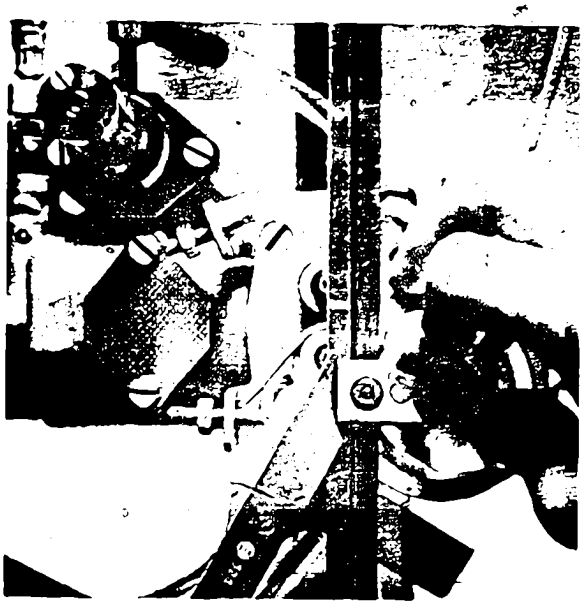
Setting the full load quantity

Operate pump at the speed specified in Sect. 1.3 of the test specifications and set the full-load quantity by rotating the spill piston to the specified value.
Rotation of the spill piston in the direction of full-load stop results in a larger quantity. Fig. 12

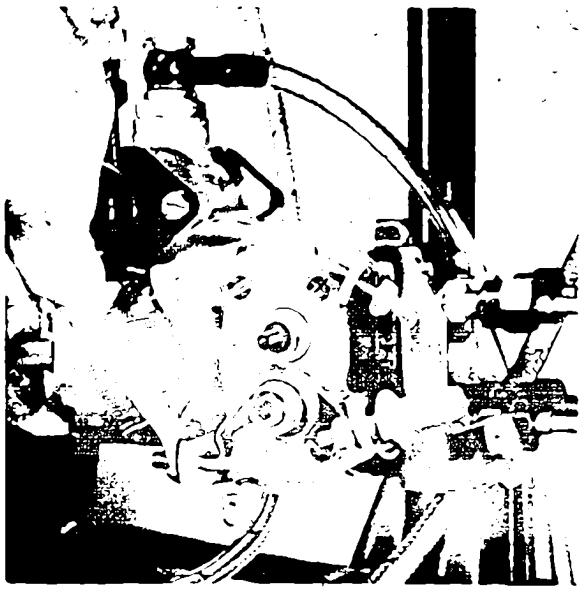
11

12

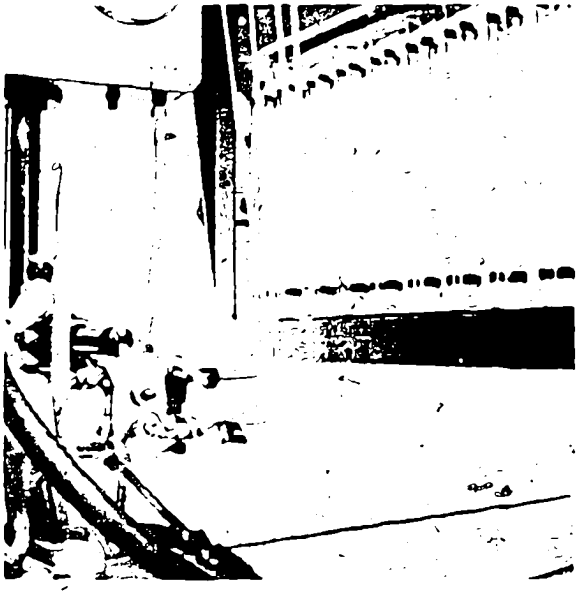




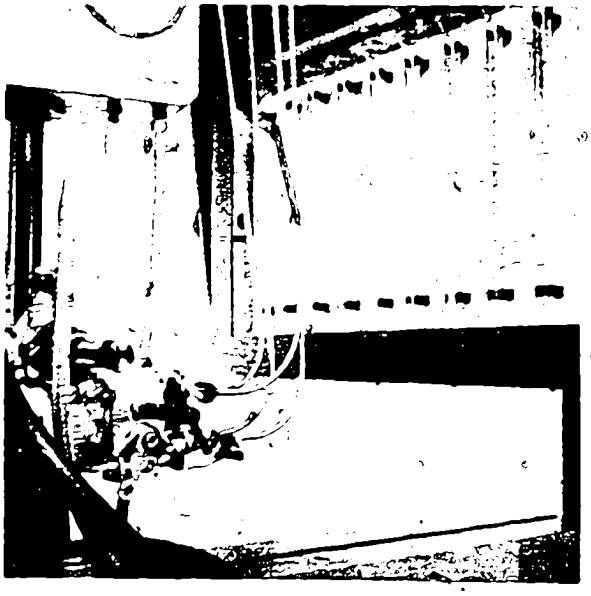
13



14



15



16

Install delivery-rate control lever

Position spring and washer. Attach delivery-rate control lever.

Installation position:

Push delivery-rate control lever onto the splines of the control shaft of the spill piston with consideration of the angle γ (see reverse side of test specifications). Do not turn the spill piston. Angle γ is the deviation of the delivery-rate control lever from the perpendicular in direction of the full-load stop.

If the lever cannot be installed in the specified tolerance range, another lever in which the gearing is offset by one-half tooth should be used. Fig. 13

Let the full-load stop screw rest on the mounted delivery-rate control lever and secure it with a nut. Do not turn the spill piston. Attach delivery-rate control lever with nut and lock washer.

In pumps without spring-loaded stop, turn spill piston to stop position by means of the delivery-rate control lever and verify if zero delivery occurs at nominal speed.

If necessary, use a lever with gearing offset by one-half tooth*.

*Lever with punch marks is offset by one-half tooth compared to a lever without punch marks. Fig. 14

Place delivery-rate control lever against full-load stop screw.

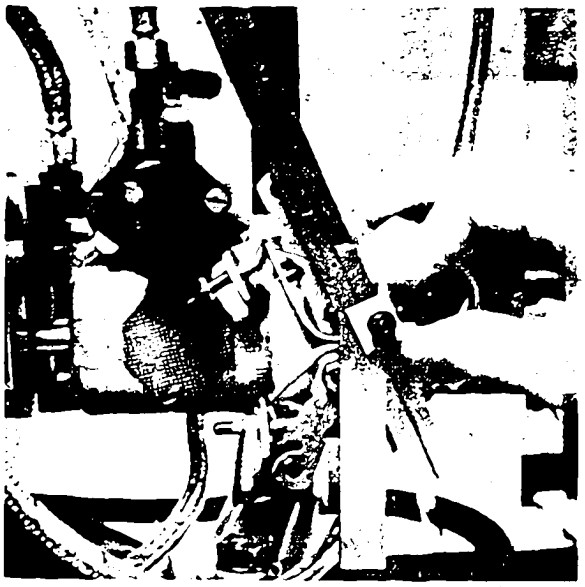
Operate pump at the speed specified in Sect. 1.3 of the test specifications and set full-load quantity by turning the adjustable stop screw. Fig. 15

Setting of idling breakaway

Operate pump at the speed specified in Sect. 1.4 of the test specifications.

The delivery-rate control lever then rests on the full-load stop.

Turn throttle in the direction of the idling stop until the required idling quantity is reached. Fig. 16



17

Install speed control lever

Position spring. Install speed control lever.

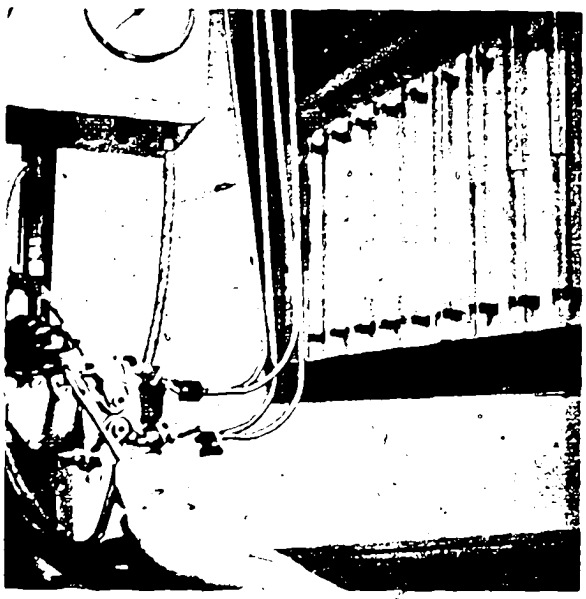
Installation position:

Push speed control lever onto the splines of the throttle control shaft with consideration of angle α (see reverse side of test specifications).

Do not turn the throttle.

The angle α is the deviation of the throttle from the perpendicular in direction of the idling stop.

If the lever cannot be installed in the specified tolerance range, another lever with a 1/2 tooth offset should be used. Fig. 17



18

Let the idling stop screw rest on the installed speed control lever and lock the stop screw with a nut.

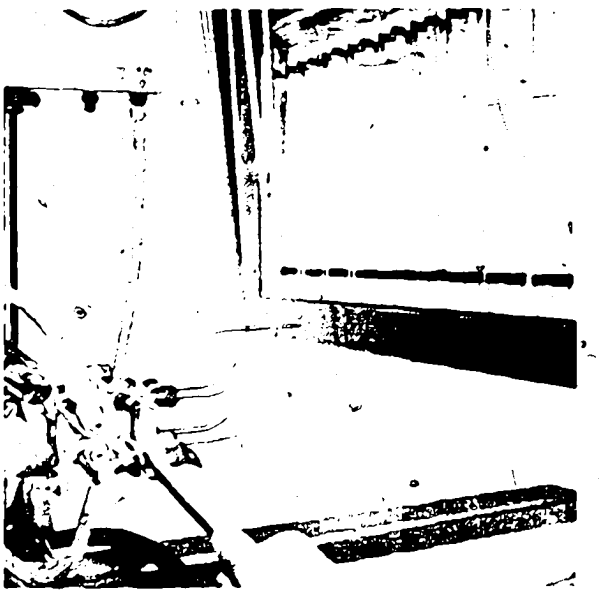
Do not turn throttle.

Install speed control lever with spring lock washer and nut.

Place delivery-rate control lever on the full-load stop.

Place speed control lever on the idling stop.

Operate pump at the speed specified in Sect. 1.4 of the test specifications and set idling quantity by rotating the adjustable idling stop screw. Fig. 18



19

Start Quantity

The pre-stroke, delivery valves and wear in the distributor-type pump influence the start quantity.

Adjust the mechanical start quantity

Operate the pump at the speed specified in Sect. 1.5 of the test specifications.

Note: In C-version pumps, the speed control lever does not necessarily have to be in idling position.

Slowly pull delivery-rate control lever in the stop direction until the start quantity is delivered just before the stop. Place spring-loaded stop on delivery-rate control lever (do not compress spring) and secure with nut. Measure the start quantity (only at 200 kgf/cm² [2840 psi] outlet, of specified). If necessary, correct by turning the adjustable stop screw.

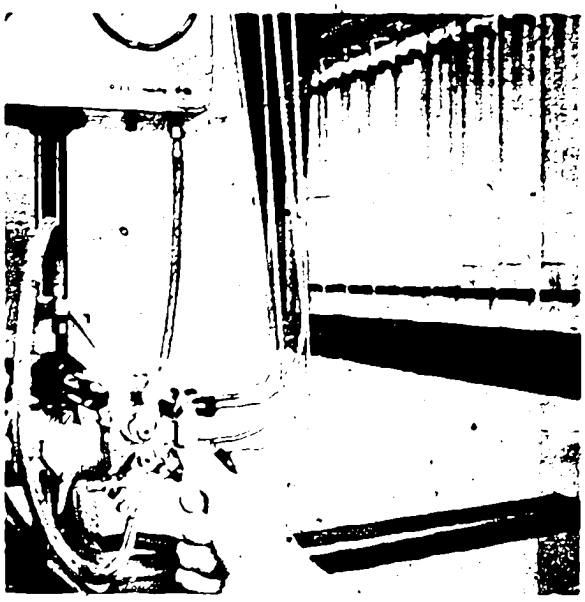
In the stop position (= with delivery-rate control lever overdepressed by about 10°), verify if zero delivery is reached at nominal speed.

The angle δ is the total deflection of the delivery-rate control lever (full-load to stop). Fig. 19

Measure automatic start quantity

Operate pump at the speed specified in Sect. 1.5 of the test specifications.

Measure start quantity.



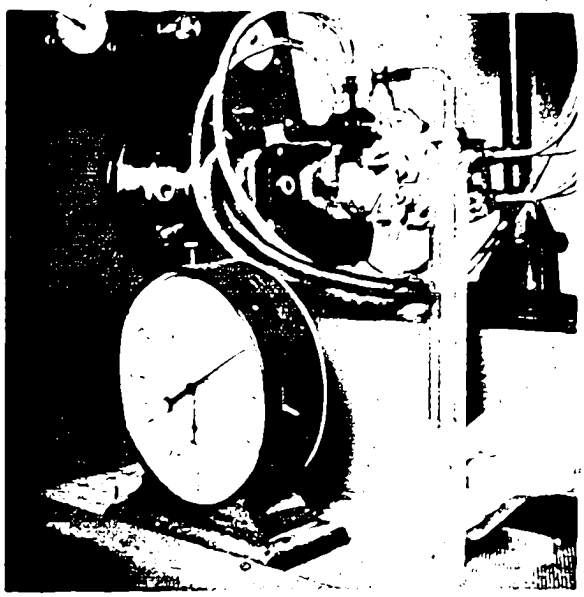
20

Setting the maximum speed breakaway

Place delivery-rate control lever on full-load stop.
Slowly increase the speed until the value specified in Sect. 1.6 in the test specifications is reached and at the same time, move speed control lever in the direction of maximum speed breakaway. Be careful that delivery does not stop.
Place adjustable stop screw on the speed control lever and adjust the fuel delivery quantity by rotating the adjustable stop screw.
The angle β is the total deflection of the speed control lever (Idling to maximum speed stop).

Test Pump

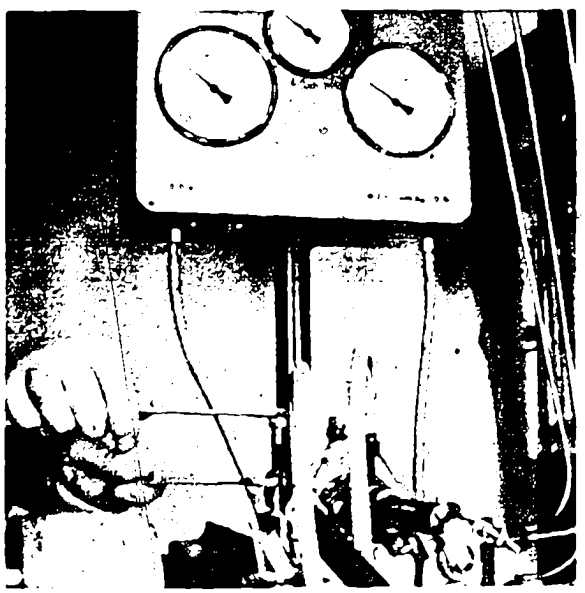
When testing the distributor-type pump only the values not in parentheses in Sect. 2 of the specifications apply



21

Check the overflow quantity

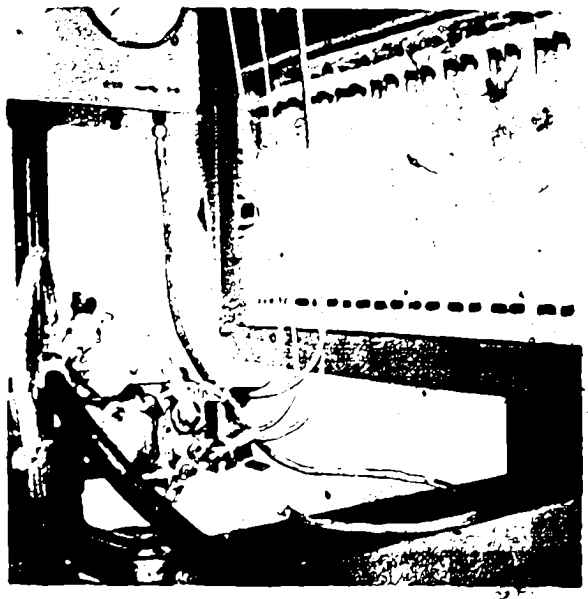
Operate pump at the specified speed. Collect the overflow quantity in a graduate and measure the volume. If the overflow quantity specified in the test specifications is not reached, the overflow valve should be replaced.



22

Check timing device characteristics and supply pump pressure characteristics

Place delivery-rate control lever on full-load stop and speed control lever at the maximum speed stop.
Check timing device characteristics according to Sect. 2.1 and the supply pump pressure characteristics according to Sect. 2.2 of the test specifications and if necessary reset within the tolerance (as described in the Section on "Pump Setting" on page 8).
Defects of the supply pump or pressure control valve affect the timing device characteristics and the supply pump pressure characteristics.
Defects in the timing device (for example, wrong spring) affect only the timing characteristics.
Disconnect measuring device for measuring the timing device characteristics as well as the pressure gauge hose. Install cover, be careful to insert the rubber gasket correctly



23

Check fuel delivery and break-away characteristics

Check the fuel delivery and break-away characteristics according to Sect. 2.3 of the test specifications.

Defects in the distributor head and delivery valves appear in the full-load delivery characteristics.
Defects in the timing device appear in the break-away characteristics.
Positions of the delivery rate control and speed control levers according to test specifications.
Do not read the 200 kgf/cm² (2840 psi) outlet in full-load and partial-load delivery quantity measurements.
Read start quantity only on the 200 kgf/cm² (2840 psi) outlet if indicated in the specification sheet.
The cut-in and cut-out point of the automatic start quantity control is influenced by the supply pump pressure and can be corrected by changing this pressure. The correction must be within the tolerance range of the supply pump pressure and the timing piston travel.
Hook in springs for the delivery rate control and speed control levers.
Demount pump and attach seals.

4. Checking

Only the values listed in parentheses in Sect. 2 of the test specifications are valid for checking a distributor type injection pump.
Checking must follow the same sequence as testing (Sect. "Test pump" p. 11).
If the pump must be adjusted, the test values apply.

5. Auxiliary Tools
5. Outillage auxiliaire
5. Herramientas auxiliares

Splines (delivery rate control and speed control levers are centrally brazed, sawed off and turned).

Denture cannelée pour levier de régulation du débit ou levier de régulation de vitesse, brasée centralement, sciée et finie au tour.

Dentado de entalladura de la palanca del caudal o de régimen, sujeto aquí centralmente con soldadura fuerte, cortado y retorneado

Sketch 1

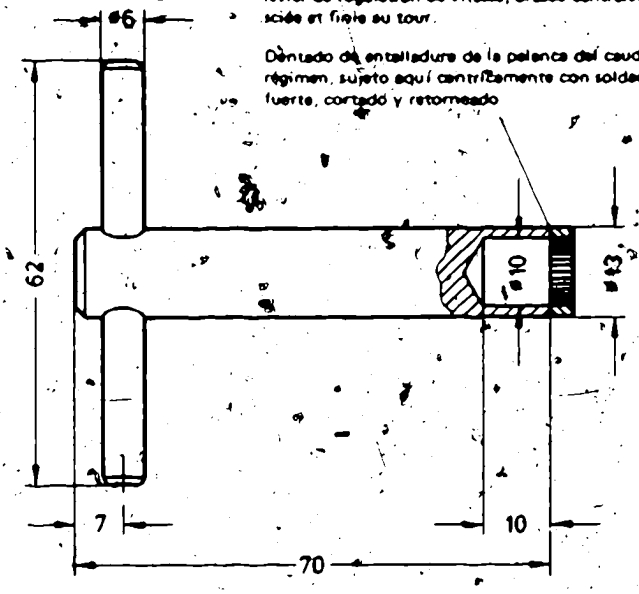
Auxiliary tool
Material: steel

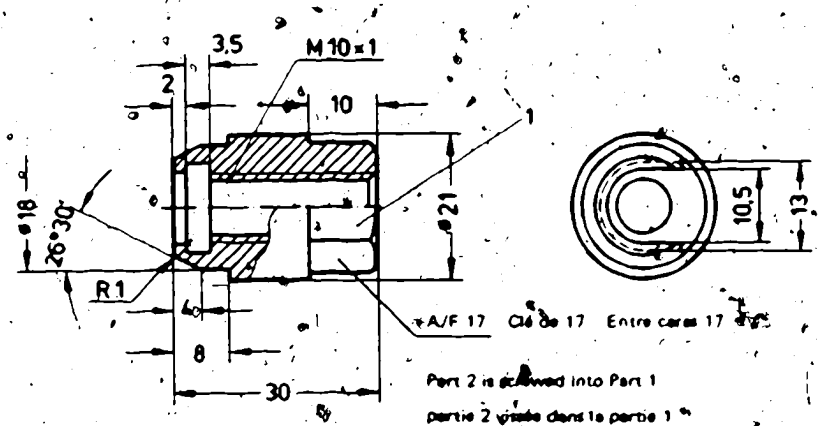
Croquis 1

Outil auxiliaire
Matériau : acier

Croquis 1

Herramienta auxiliar
Material: Acero





Sketch 2

Mandrel
Material: steel

Croquis 2

Outil à emmancher
Matériau : acier

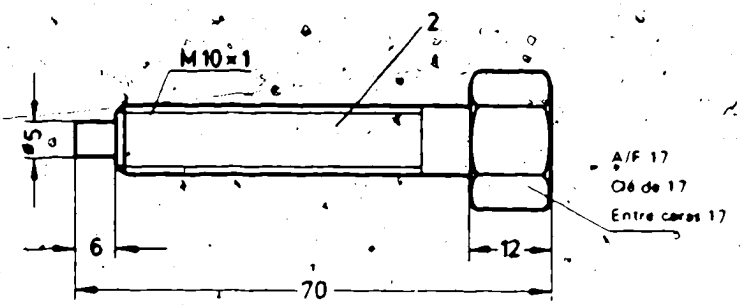
Croquis 2

Herramienta de calar
Material: Acero

Part 2 is screwed into Part 1

partie 2 vissée dans la partie 1

Pieza 2 atornillada en la pieza 1



BOSCH

TEST INSTRUCTIONS

46

VDT-WPP 161/4 B Suppl. 1
Ed. 1

Distributor-type Fuel Injection Pump

0 460 . . EP/VA . . H . . C . .

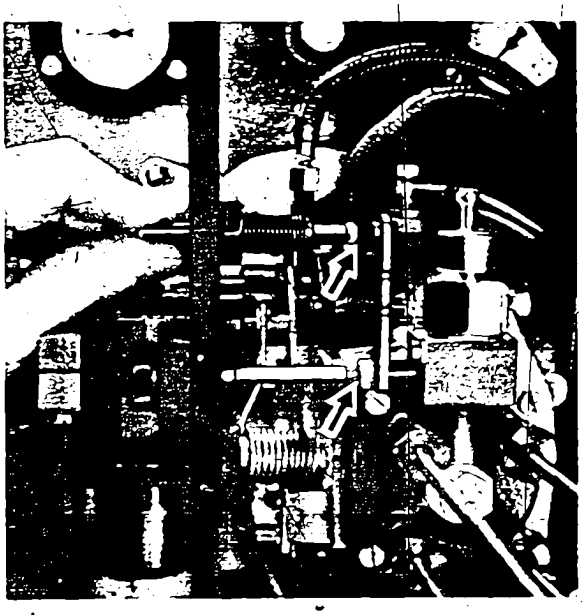
This supplement contains new developments which apply to the indicated sections of instructions VDT-WPP 161/4 B when testing distributor-type fuel injection pumps EP/VA . . H . . C . .

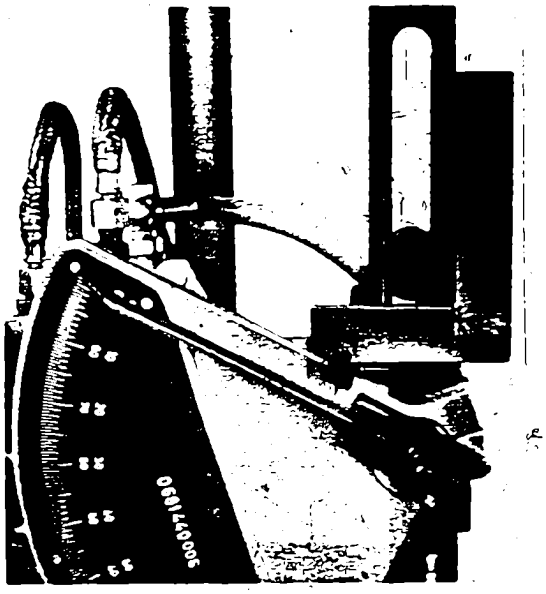
1. Setting and testing the idle breakaway of EP/VA . . H . . C . . injection pumps with quiet-idle device.

2. Pressing the clamping sleeve into the pressure regulating valve.

1. Setting and testing the idle breakaway

When setting and testing the idle breakaway of EP/VA.. H..C.. injection pumps with quiet-idle device (called QD in the text) the QD must be switched on. The lever of the QD must be set at a certain angle and the speed control lever must be up against the idle stop.
Note: Do not remove QD lever.





Setting the quiet-idle device

Remove bracket and retighten screws for hydraulic head.

For setting the angle of the QD lever, mount setting device 0 681 440 006 – EFEP 56 C on the test bench and align it with the QD shaft.

Align pin (manufactured locally according to Drawing 1) to QD ball-type bolt.

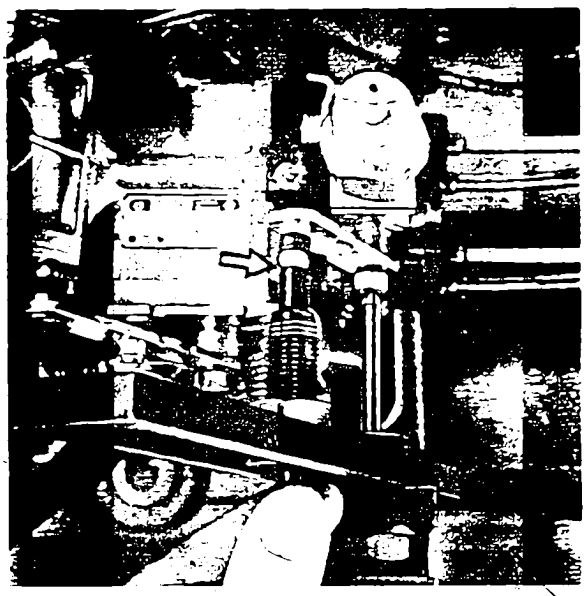
Set swivel arm of setting device vertically by means of a square. Set pointer of angle scale to "0". Set QD lever to the required angle, this is worked out by taking the number which is stamped on the QD and adding 5° (e.g. 21 (stamped number) plus 5 = 26° which is the required angle). This angle is the deviation of the QD lever from the vertical in direction of the speed control lever.

Set angle on setting device and clamp swivel arm.

F2

Adjust QD lever until setting device pin is in alignment with the ball-type bolt when pressed up against it. Attach return hose to QD.

Set idle breakaway according to VDT-WPP 161/4 B then mount speed control lever and set stop.

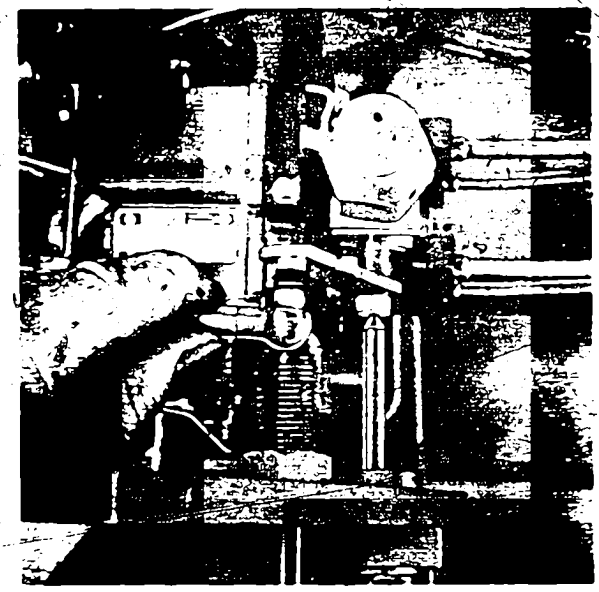


3

Fit linkage on ball-type bolt of speed control lever.

Press the pin against the ball-type bolt of the QD again. Speed control lever must be up against the idle stop. Adjust length of linkage so that the ball socket of the linkage can be pushed on to the ball-type bolt of the QD without changing the position to which the lever has been set.

Remove setting device.
Tighten screws of bracket with the prescribed torque.
Test breakaway again.

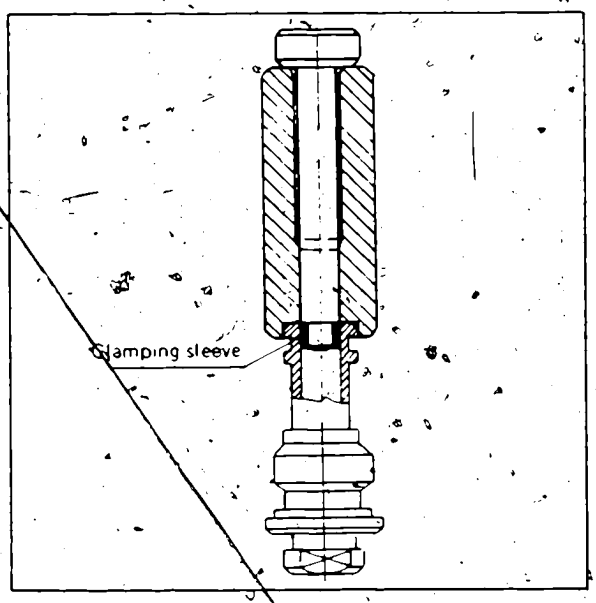


4

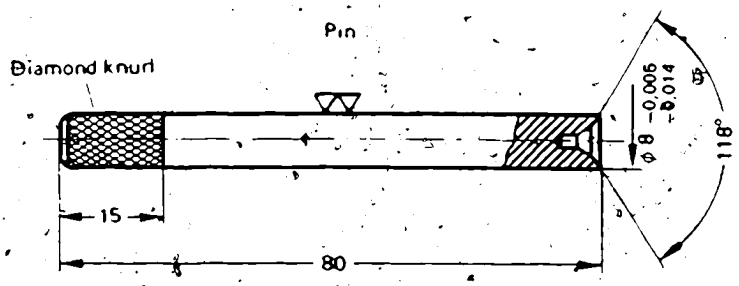
2. Pressing the clamping sleeve into the pressure regulating valve

In the text of instructions VDT-WPP 161/4, Ed. 1, page 10, paragraph "The following work step is necessary", the sentence "Reinstall spring and piston, press in clamping bushing until flush" changes as follows:

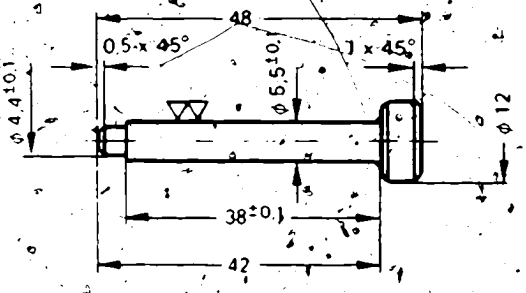
Reinstall spring and piston and, using tool manufactured locally according to Drawing 2, press in new clamping sleeve – see service parts list – until flush.



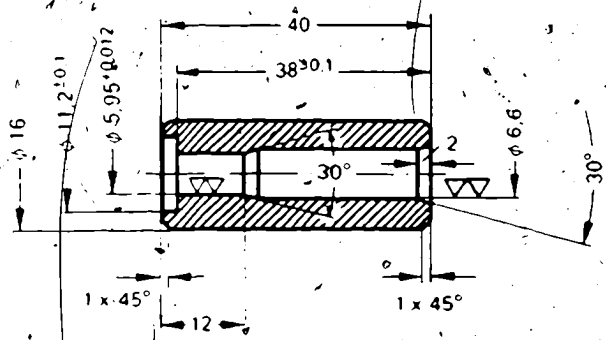
5



Drawing 1
Material: Steel



Drawing 2
Material: Steel



ϕ = dia
All measurements in mm

Robert Bosch GmbH (12.73)
D-7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.

BOSCH

Distributor-type Fuel Injection Pump

0 460 . . EP/VA . . H . . C . .
with Manifold Pressure Compensator

This supplement describes the procedure for testing the distributor-type fuel injection pump EP/VA..H..C.. **with manifold pressure compensator.**
The following points apply to the indicated sections of Test Instructions VDT-WPP 161/4 B.

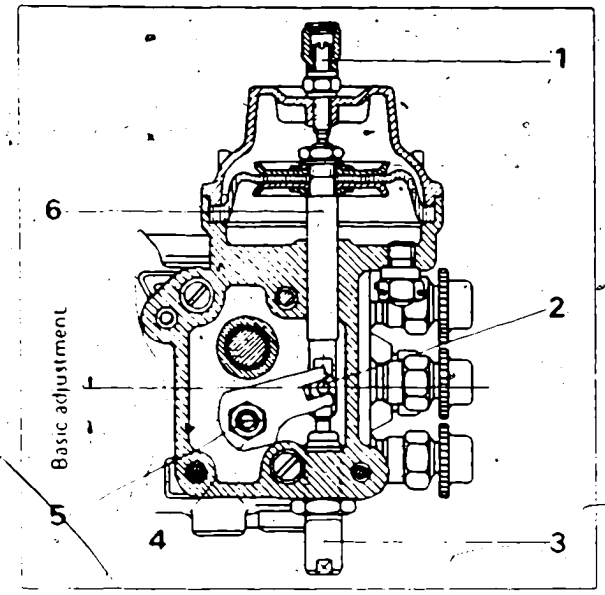
1. Adjust and check manifold pressure compensator.

2. Measure automatic starting fuel delivery.

1. Adjust and Check Manifold Pressure Compensator

Replaces Figs. 12 to 15 and associated text in VDT-WPP 161/4 B.

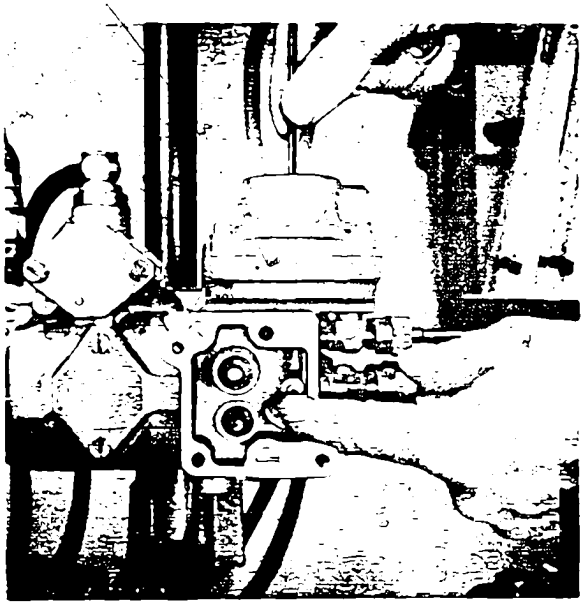
Unscrew housing cover.
Remove adjusting screw (1), stop (3), and lever (4).



1

Check that the control rod (6) and the stop (3) can move freely.

Screw the adjusting screw (1) inward until it rests against the control rod (6), screw the stop (3) in for this purpose.



2

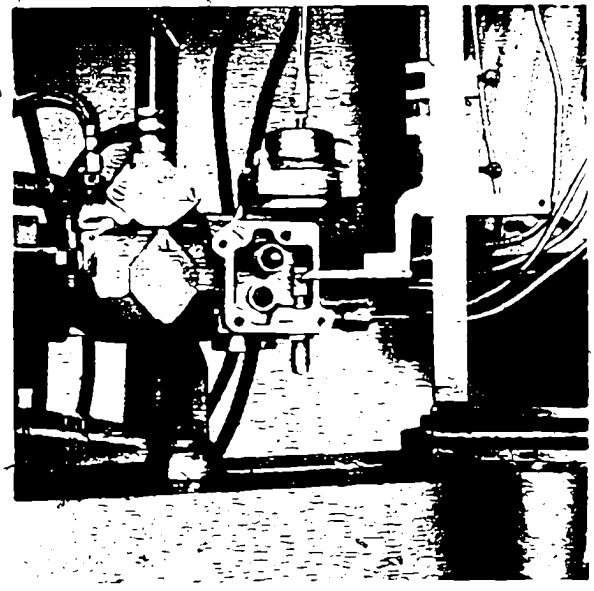
Using a commercially available calibrated scribing block, set the basic adjustment to 10 mm from the center of the governor control piston shaft (5) to the center of the bolt (2) by means of adjusting screw (1).

In order to support the calibrated scribing block, the base of the setting device 0 681 440 006 – EFEP 56 C can be mounted upside down on the test bench.

Adjust stop (3) for no play in its movement against the control rod and then turn it inward about 2 more turns.

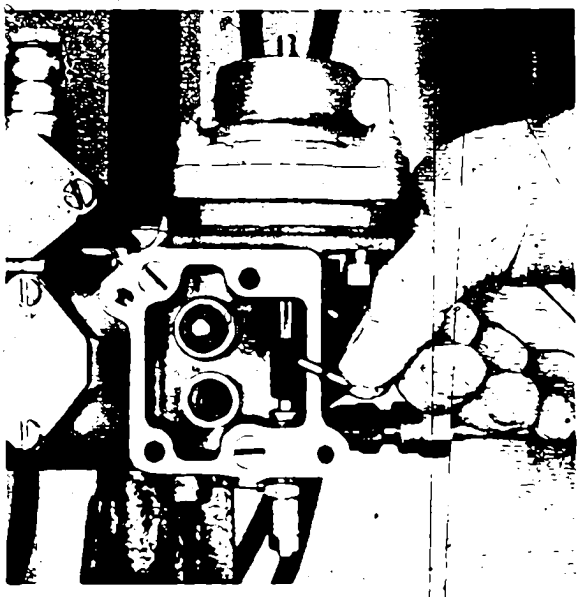
Remove the washer and the bolt (2) with the retainer from the control rod.

Adjust the full-load delivery at the governor control piston according to point 1.3 of the Test Specification Sheet.



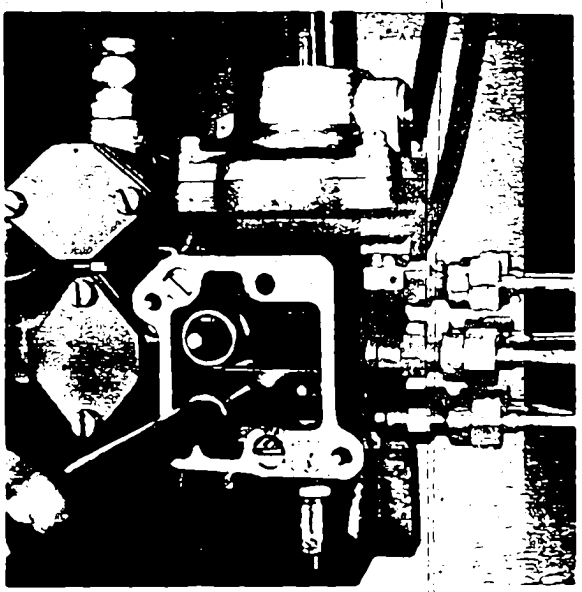
3

Insert the bolt (2) with the long guide section forward into the control rod.
Slide the washer onto the bolt.


4

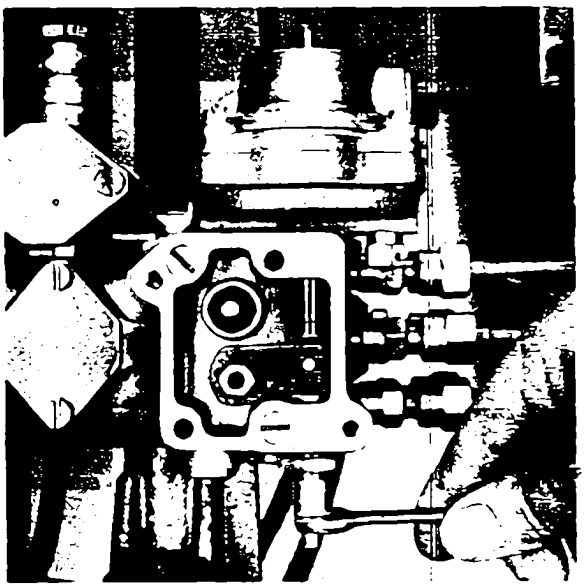
Slide the washer onto the governor control piston shaft (5). Mount lever (4) and tighten it in place.

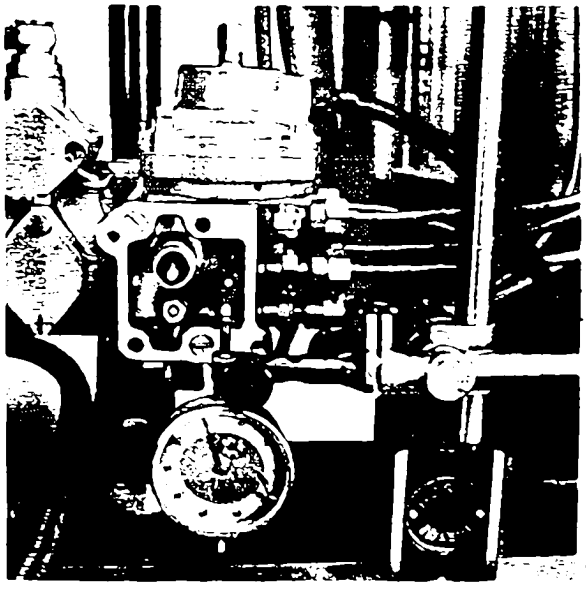
Check the full-load delivery again.
The full-load delivery can be corrected by shifting the control rod with adjusting screw (1).
Tighten the lock nut (gasket underneath!).
A deviation of ± 1.5 mm from the basic adjustment (10 mm) is acceptable and should be checked with the calibrated scribing block.
If the deviation exceeds the tolerances allowed, the lever (4) must be adjusted accordingly or replaced.


5

Connect the compressed air line to the diaphragm housing. The regulating valve with throttle screw in vacuum gage 1 688 130 031 – EFEP 425 or 1 688 130 032 – EFEP 445 with a manometer (0 to 1.6 kgf/cm²) (quality class 1.0, scale graduations each 0.05 kgf/cm²) can be used to measure the pressure of the compressed air.

Leakage test of the diaphragm.
Mount the cap nut over the adjusting screw (1) with the gasket. Set the compressed air to a pressure of 1.0 kgf/cm².
Close connection "2" to the regulating valve and stop the supply of compressed air. There must be no drop in pressure as shown by the manometer.


6



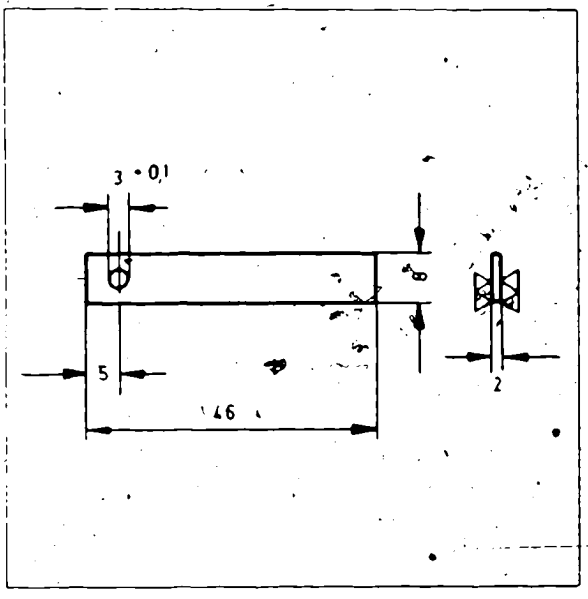
7

With stop (3) set the full-load delivery at maximum manifold pressure according to point 1.3 of the Test Specification Sheet and tighten the lock nut.

Check the other full-load points again.

Make the adjustment test of stop (3) according to the Test Specification Sheet using the dial indicator and dial holder.
EFEP 455/0/2 or a tool, locally manufactured according to Fig. 8 can be screwed onto the dial indicator as a measuring base.
Drive the injection pump at about idling speed.

Replace the housing cover with seal.



8

2. Measure the Automatic Starting Fuel Delivery

Special point to be noted in the text in VDT-WPP 161/4 B, Edition 1, Page 12, under "Measure Automatic Starting Fuel Delivery".
Place the speed control lever against the end stop.

Robert Bosch GmbH (12.73)
D-7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

After-sales Service Instructions

Repair instructions

46

VDT-W-460/101 En
Ed. 2
replaces VDT-WJP 161/4 – Suppl. 3

Distributor-type fuel-injection pump 0 460 . . VA . . H . . C . .

Simplified measuring method

BOSCH After-sales Service
Automotive
Equipment

This publication has been redesigned with the forthcoming change-over to microfilm in mind.
When a publication has been transferred to microfilm, the screen will be filled completely by a quarter of a printed-publication page. For this reason, it is unavoidable that illustrations are repeated in the case of longer texts in which reference is constantly being made to a particular illustration.
Until the change-over to microfilm, we have slightly reduced the size of the print and of the illustrations.

Contents

1 Tools
2 Measuring the governor spring chamber
3 Measuring the electrical shut-off spring chamber

Published by After-sales Service Department for Training and Technology (KH/VSK). Please direct questions and comments concerning the contents to our authorized representative in your country

Printed in the Federal Republic of Germany. Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH.
(6.1979)

1. Tools

Measuring tool KDEP 1023 for measuring length: force ratio
Measuring tool KDEP 1094 for measuring the governor springs
Measuring tool KDEP 1095 for measuring the electrical shut-off spring chamber

2. Measuring the governor spring chamber

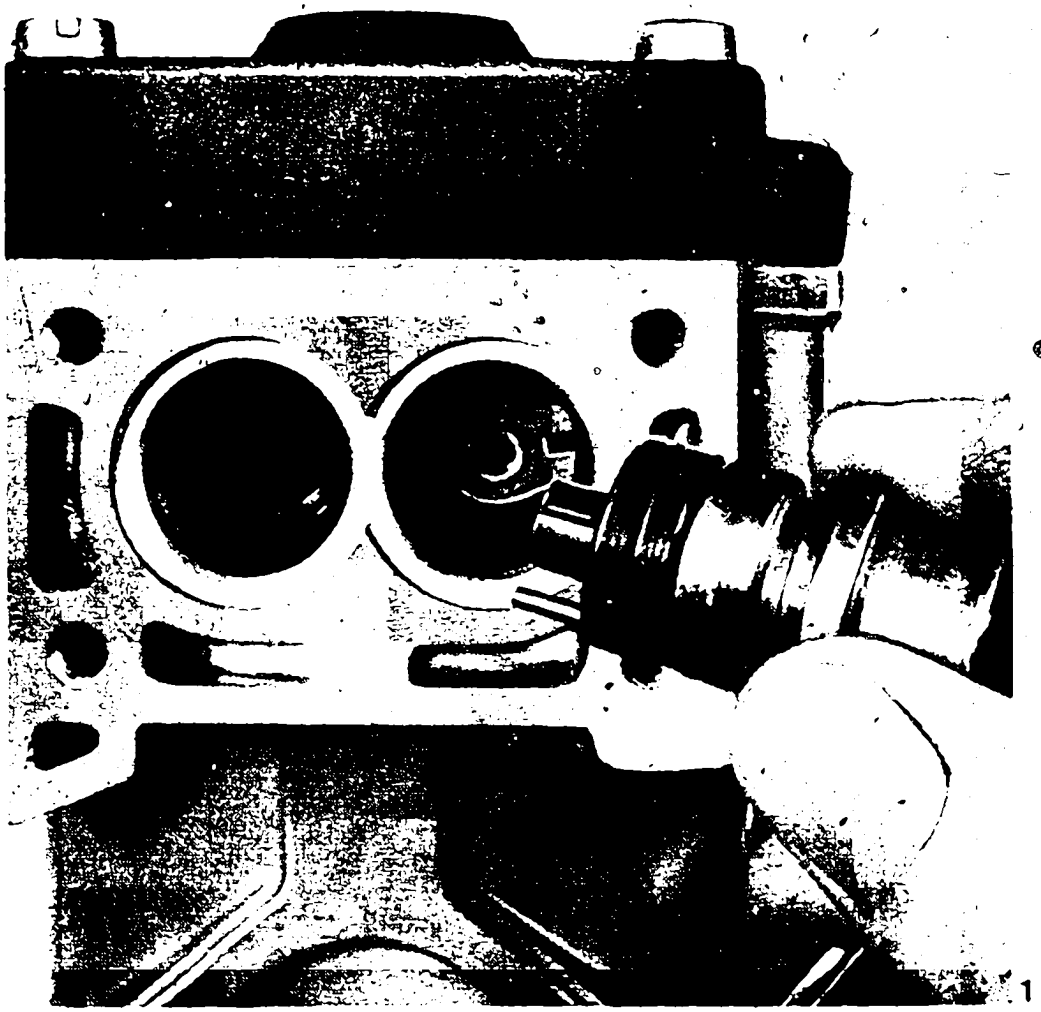
These instructions replace Figs. 54 to 57 and the associated text in VDT-WJP 161/4 B.

The remarks associated with Fig. 54 from "Setting the governor spring": through "Push the control spool up against the mechanical stop." continue to apply.

Initially, do not fit O-rings on the shaft and on the bushing of the delivery rate control device. There should be no shim on the shaft.

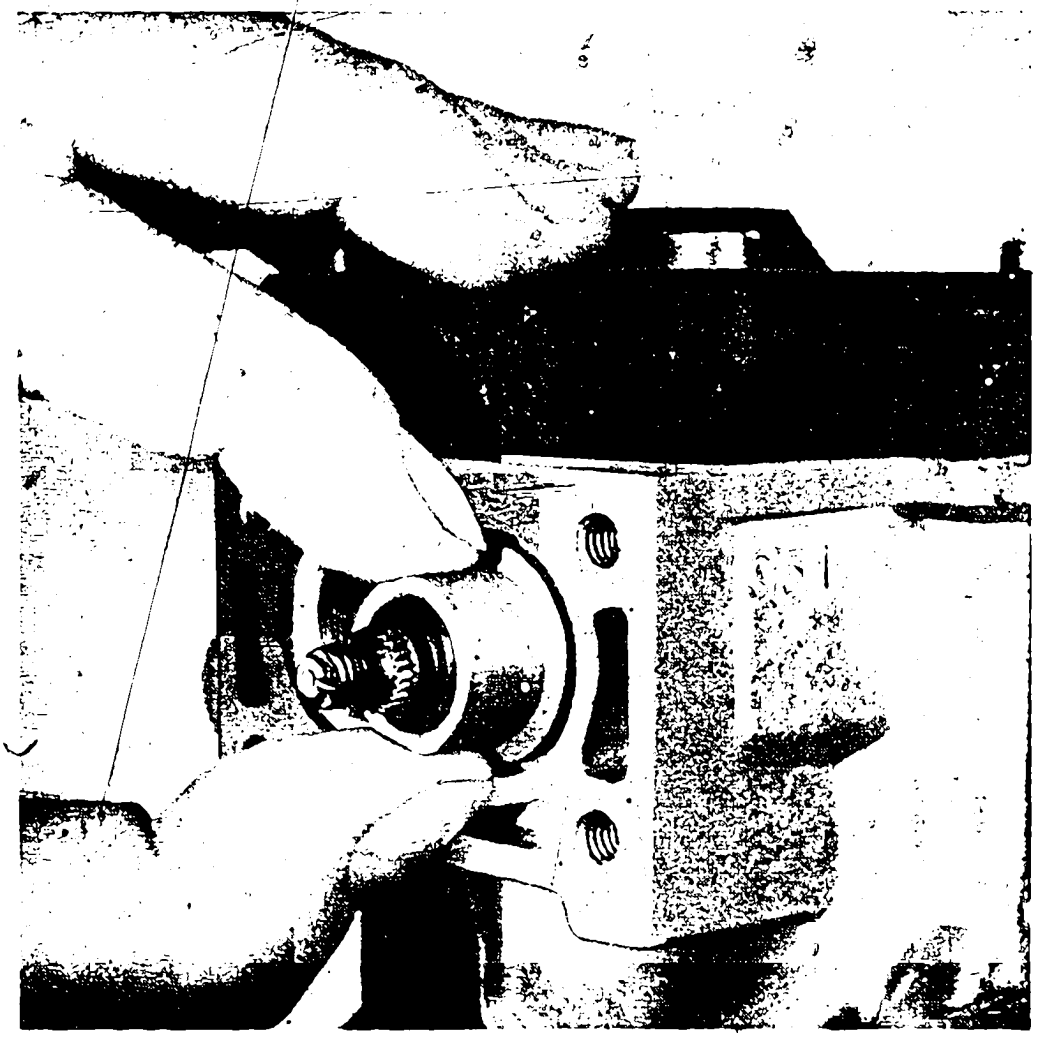
Insert the shaft into the bushing.
Note the washer between the shaft and the bushing.

Set the measuring tool KDEP 1094 to an overall length of about 2 mm longer than dimension V given in the Test Specifications Sheet.



Insert the measuring tool KDEP 1094 instead of the control spring into the shaft.

Insert the bushing, shaft, and tool, with the slotted bushing forward, into the delivery rate control device port.

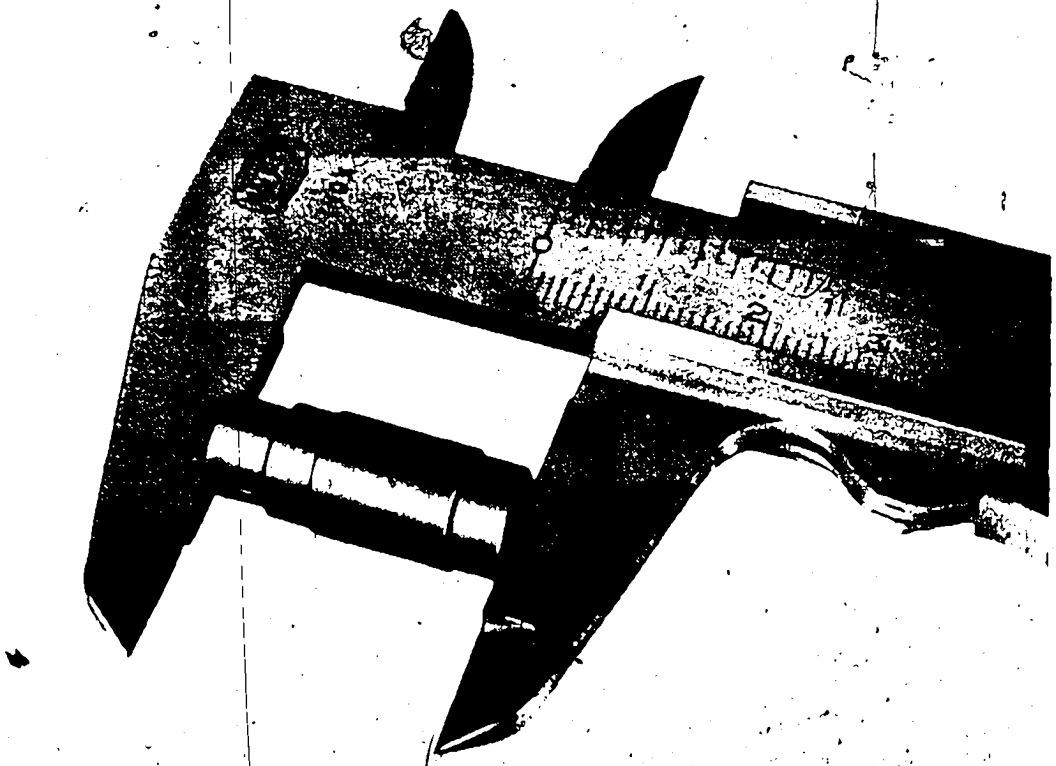


2

Press only the bushing against the hydraulic head and control spool, which is resting against the mechanical stop, until the shoulder of the bushing rests against the pump housing.

Pressing on the shaft will result in an incorrect measurement.

Note:
The drive pin on the shaft must not press against the control spool.



3

Remove the bushing, shaft, and tool.

Remove the tool from the shaft and measure its length.

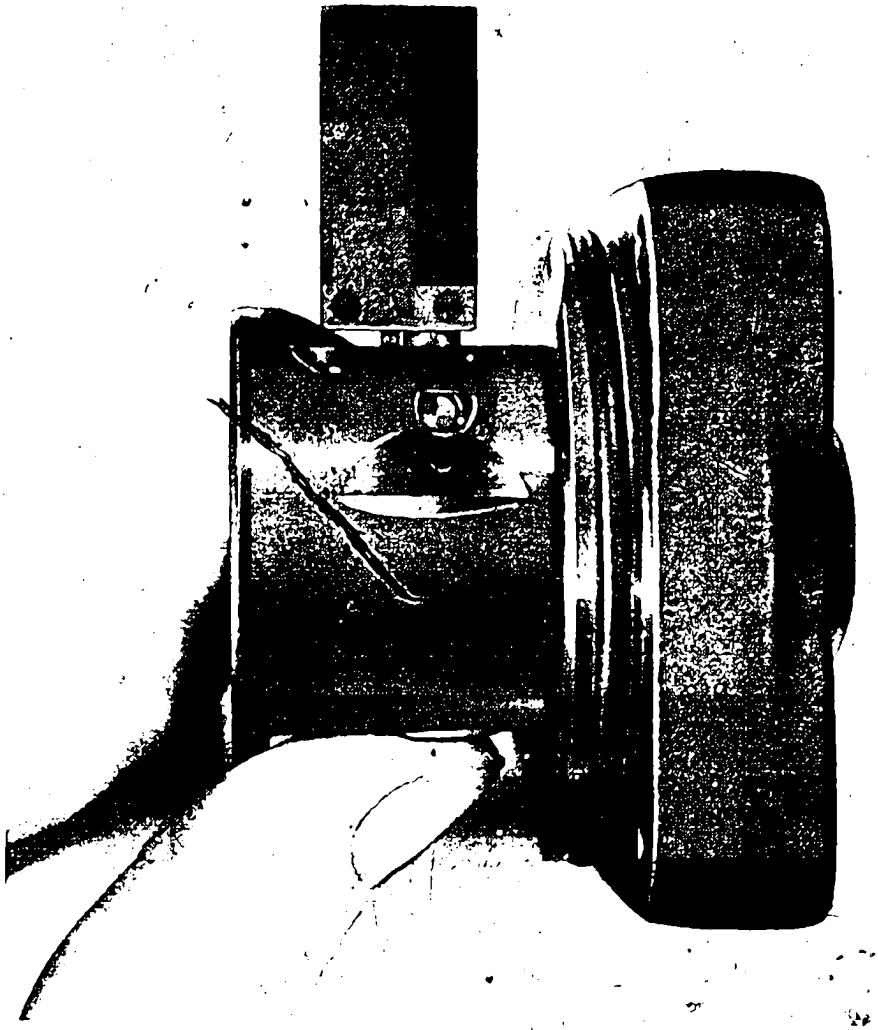
Compare the dimension measured with the specified dimension (dimension V – Test Specifications Sheet), and compensate for the difference with suitable shims.

Place O-rings on the shaft (with assembling sleeve) and on the delivery rate control device bushing.

3. Measuring the electrical shut-off spring chamber

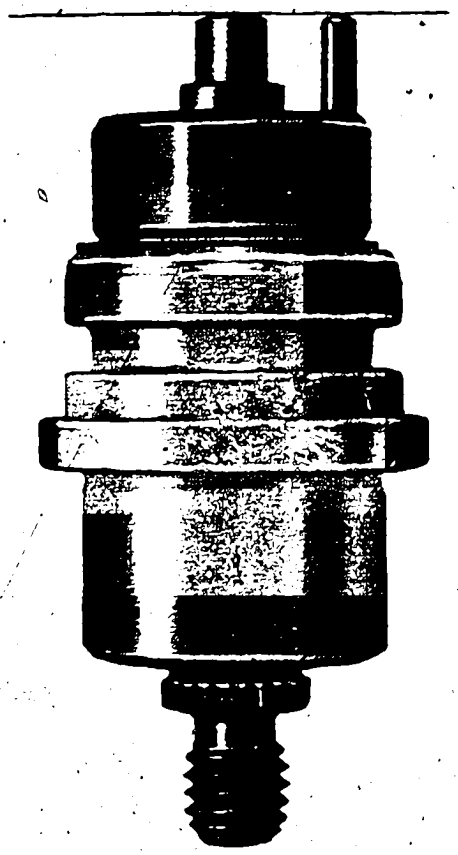
These instructions replace Figs. 8 to 11 and the associated text in VDT-WJP 161/4 B, Supplement 1.

The introductory remarks in Section d) "Electrical Shut-offs" from the beginning of the section through "This spring must be installed with a given initial tension" and the concluding remarks from "All other operations ..." continue to apply.



4

Measure the length of the shut-off stroke at the hydraulic head with a depth gauge. Press the throttle in to its rest position for this measurement. The throttle projects out from the hydraulic head by the length of the shut-off stroke.



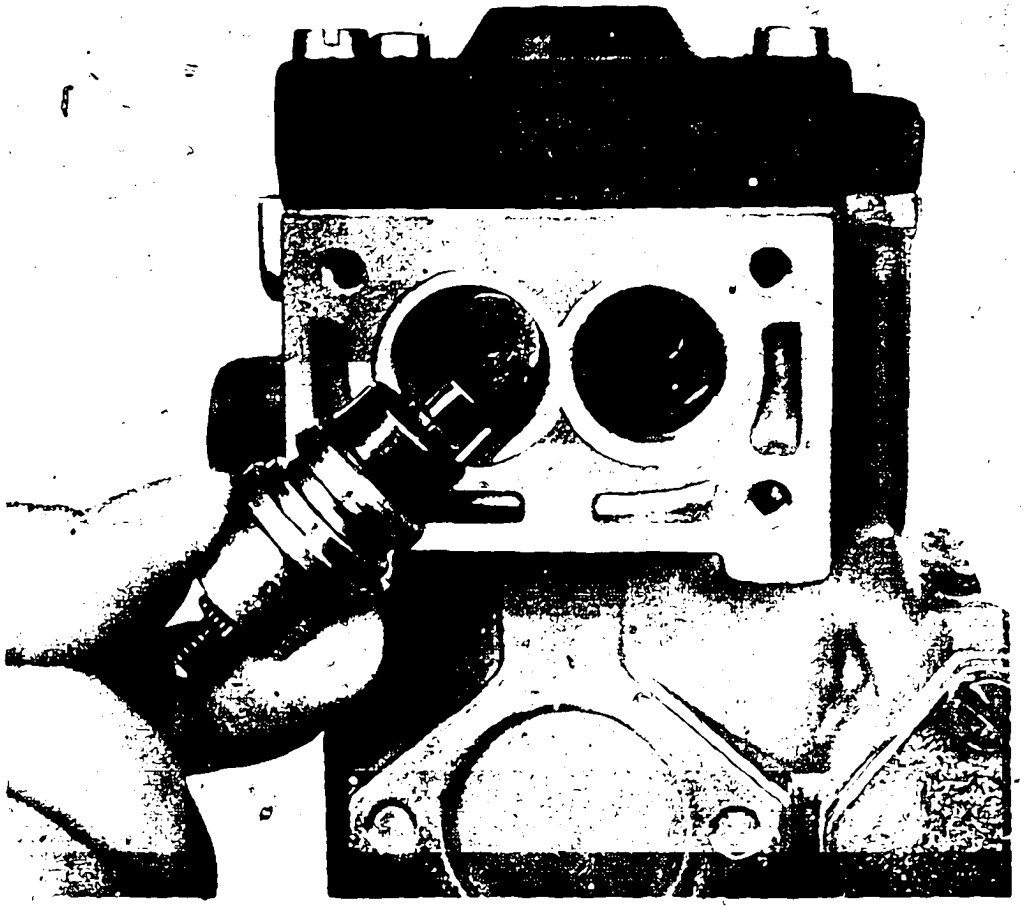
5

Initially, do not fit O-rings on the shaft and on the bushing of the speed control device.
There should be no shim in the shaft.

Insert the shaft into the bushing.
Note the washer between the shaft and the bushing.

Insert the measuring tool KDEP 1095 with the slotted bushing forward, into the shaft.

Set the tool to an overall length so that its pin is aligned with the pin of the shaft.

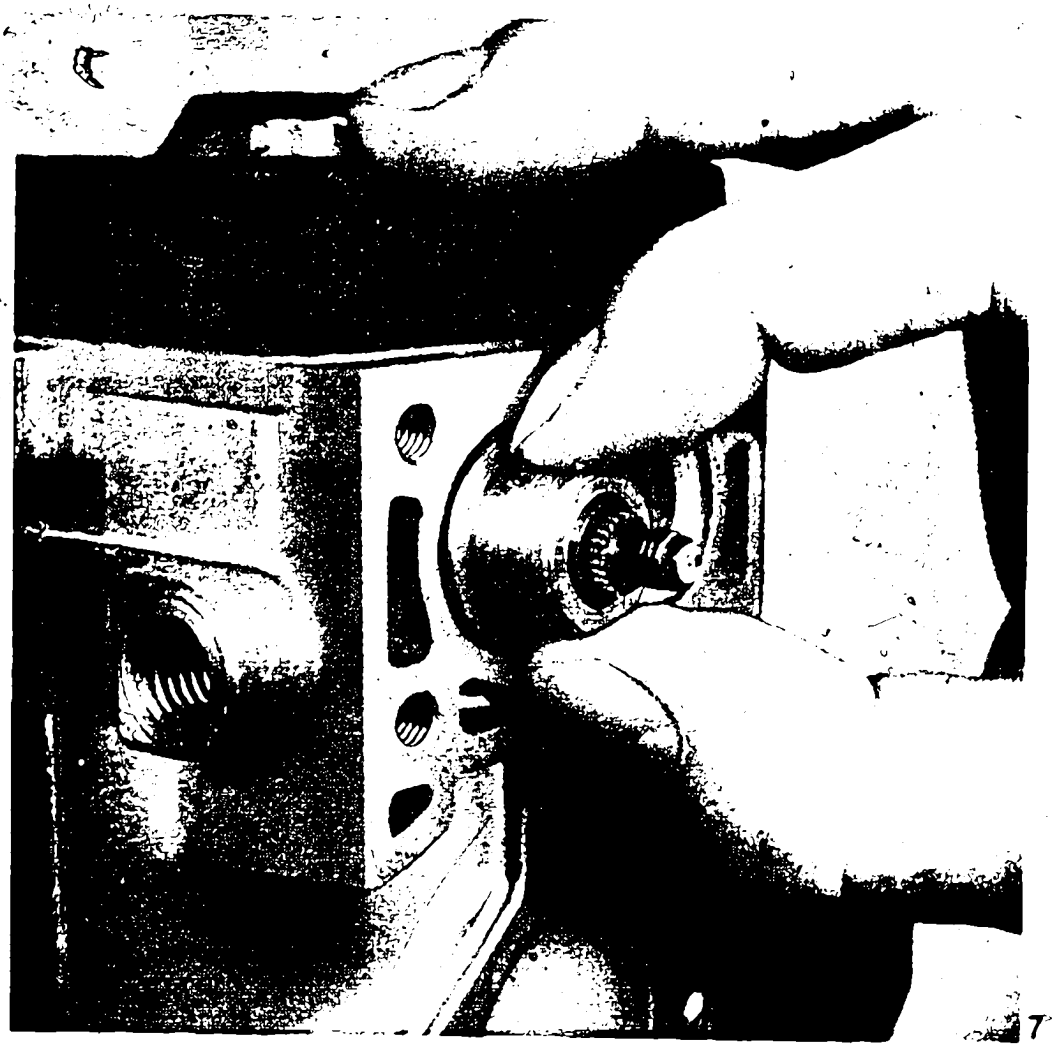


6

Press the throttle all the way into the hydraulic head.

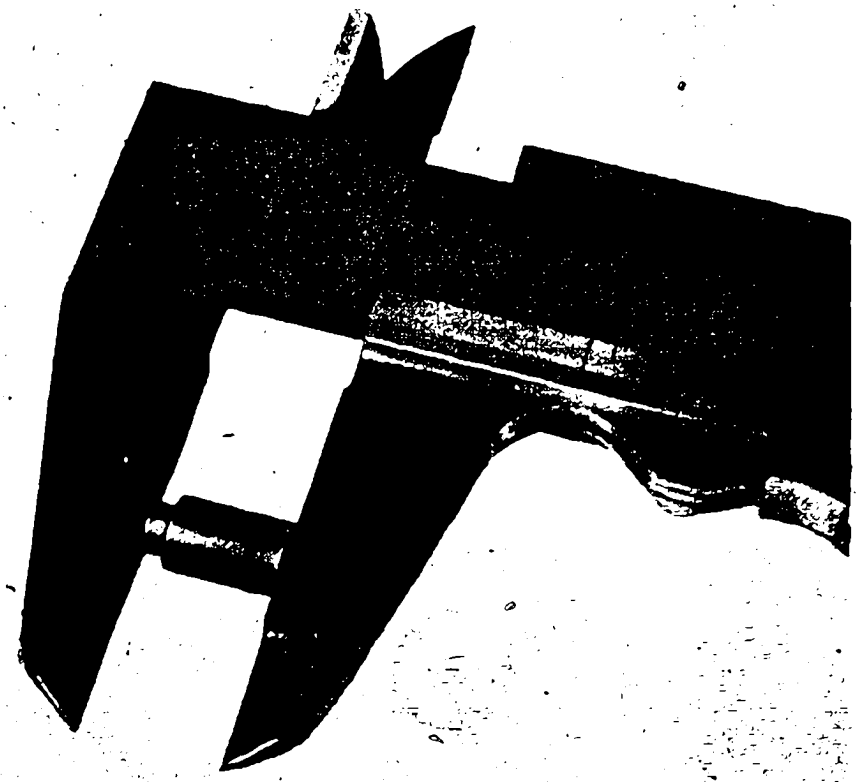
Insert the bushing, shaft, and tool into the speed control device port.

Be sure that the drive pin on the shaft engages the drive notch in the throttle.



Press only the bushing against the hydraulic head until the shoulder of the bushing rests against the pump housing.

Pressing on the shaft will result in an incorrect measurement.

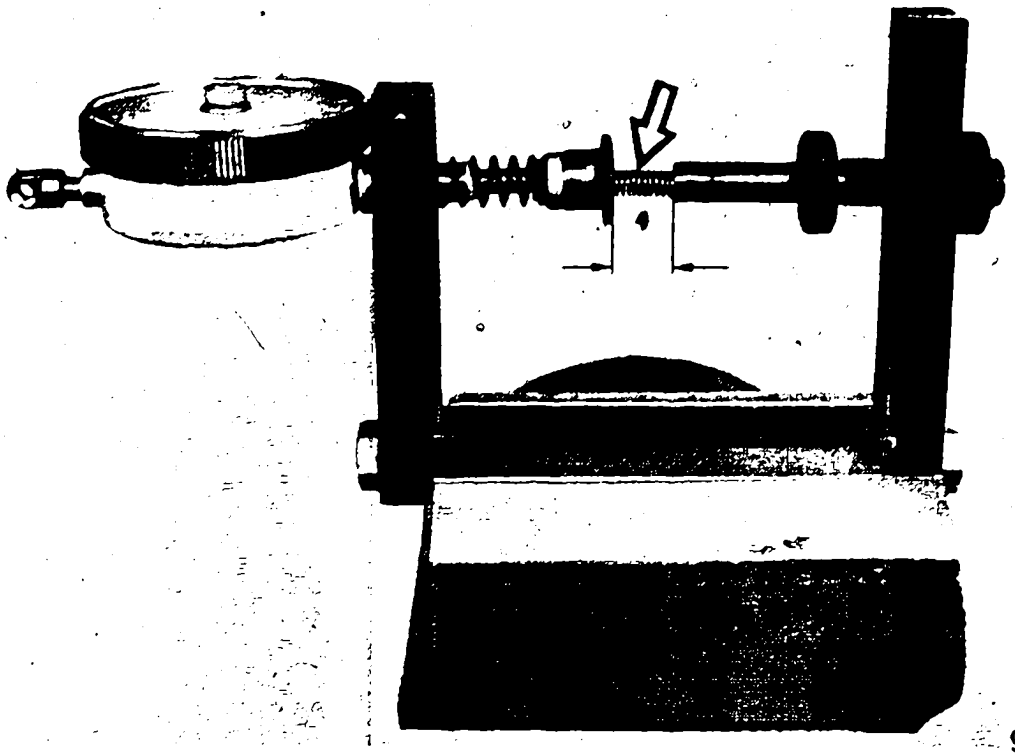


8

Remove the bushing, shaft, and tool.

Remove the measuring tool KDEP 1095 from the shaft and measure its length.

Place O-rings on the shaft (with assembling sleeve) and on the speed control device bushing.



9

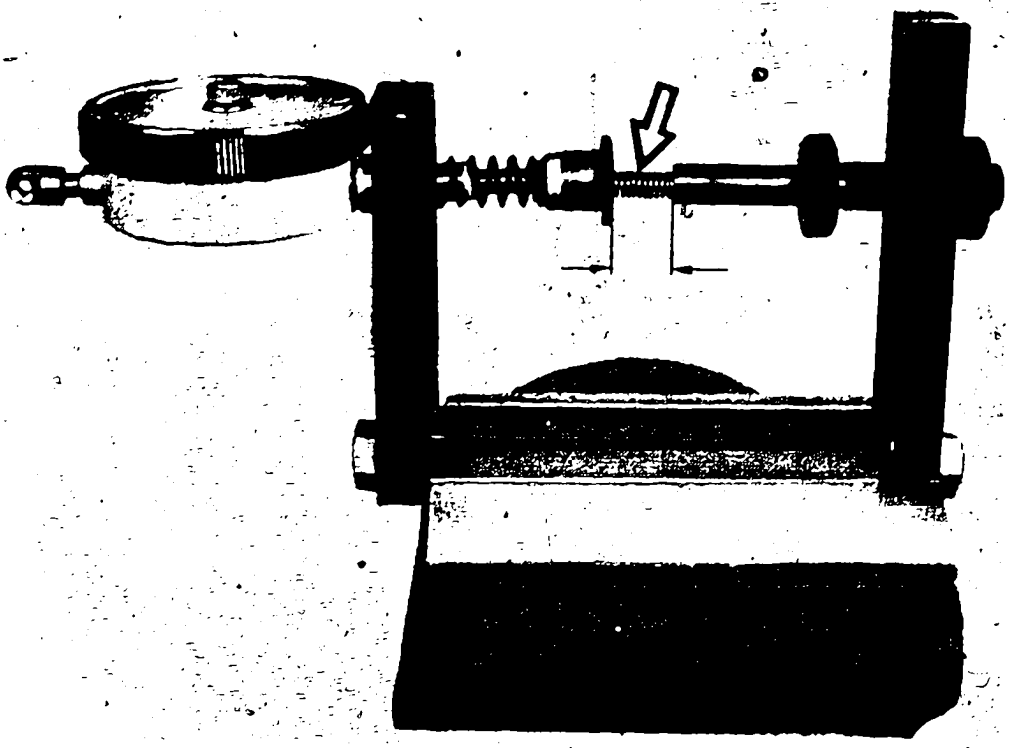
Measuring the length: force ratio of the electrical shut-off spring.

Clamp the measuring device KDEP 1023 with the spring tester in a vise.

Set the unloaded spring tester to "0".

Insert the pressure spring between the spring tester measuring sleeve and the adjusting pin of the measuring device.

Press the spring against the spring tester measuring sleeve by turning the adjusting pin until the prescribed spring pre-load given in the Test Specifications Sheet is indicated.
Tighten the lock nut of the adjusting pin.



9

Measure the length of the pre-tensioned compression spring with the caliper gauge between the measuring sleeve of the spring tester and the adjusting pin **(the spring tester must not be compressed).**

Remove the pressure spring from the measuring device.

Calculate the difference between the dimension read on the caliper gauge and the calculated length of the measuring device KDEP 1095.

Compensate for the difference with suitable shims.

Jamming of Pressure Regulator in Opel Passenger Cars

with EP/VA . . H . . CL 163 . . .

VDT-I-460/101 B
2.1977

We are occasioned to point out that the following defects may arise in Opel diesel-powered cars with EP/VA..H..CL 163.., date of manufacture 625...632:

Poor performance, blue smoke

Black smoke

A possible cause is jamming of pressure regulator 1 460 362 027..

Remedy:

Remove pressure regulator 1 460 362 027 using socket wrench KDEP 1086.

Pull out the slotted spring pin using puller KDEP 1027.
(See Test Instructions VDT-WPP 161/4 page 8, Fig. 11)

Remove the plunger by tapping lightly on the workbench or vise.

Remove the helical compression spring.

All components must be washed clean with a cold cleaning solution.

Lubricate all parts with calibrating oil prior to reassembly.

Install the helical compression spring and plunger, checking the plunger for freedom of movement.

Press in a new slotted spring pin 1 460 224 001 using an auxiliary tool to be user-fabricated. (See Test Instructions VDT-WPP 161/4 1st Supplement, Fig. 5).

Install the pressure regulator and tighten with the specified torque of 8...9 N-m 10.8...0.9 kgf-m).

Caution!

The valve setting, i.e. position of the plug in the valve holder, should not be altered.

Should this nevertheless happen, the internal pump pressure must be readjusted on the test bench.

BOSCH

Geschäftsbereich Kfz. Kundendienst Kfz-Ausrüstung
© by Robert Bosch GmbH D-7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

TIMING-DEVICE MODIFICATION

VDT-I-460/121 En

2.1981

on VA 6/100 F 1000 CR 199 or CR 199 P

(IHC engine D 310)

In order to prevent misfiring and the formation of white smoke on International Harvester tractors fitted with the D 310 engine, the VA 6/100 H 1000 CR 199 and the CR 199 P distributor-type fuel-injection pumps have been modified by increasing the timing-device adjustment range by 3°.

Until FD 922 (date of manufacture Feb. 1979), the timing-device piston was adjusted with a setting of 3° "advance". In order to shift the nominal start of pump delivery to 6° "advance", a shim was fitted between the spring cover of the timing device and the housing. A different spring (Item No. 26 on the Service Parts List, Part Number 1 464 618 005) was also fitted. These modified pumps are marked as follows: VA...CR 199 A or CR 199 PA.

As from FD 922, distributor pumps are delivered ex-works with the timing-device piston and the spring (but without shim) already set to 6° "advance". Modified distributor pumps with the code VA 6...199A which are received by service stations and which require a thorough overhaul, must be fitted with a new housing and new timing-device piston (Part Number 1 456 120 983) whereby the shim is to be removed.

Warranty:

Costs are to be borne by the customer. Warranty claims cannot be accepted.

BOSCH

Geschäftsbereich KH. Kundendienst. Kfz-Ausrüstung

F24

New Product

40...46,58

VDT-I-460/7 En

11.1985

DISTRIBUTOR-TYPE FUEL-INJECTION PUMP FOR DIRECT-INJECTION ENGINE IN FORD "YORK"

1. General

To obtain optimum torque, power, consumption, exhaust emissions and minimum generation of smoke, a distributor-type fuel-injection pump with

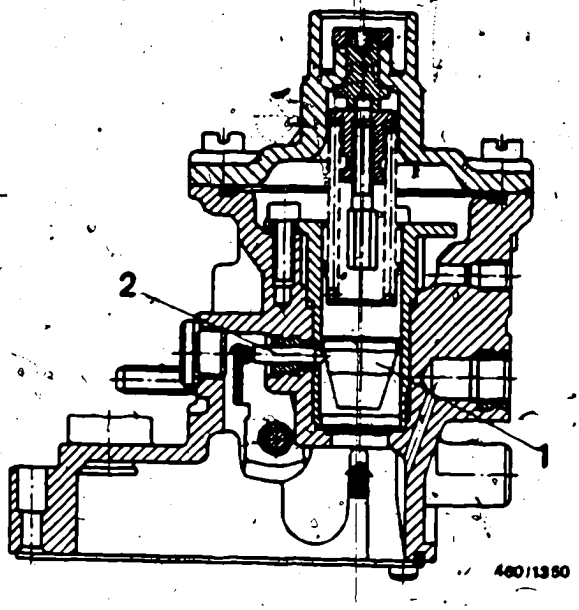
- hydraulically actuated torque control
- 2-spring timing device with return-flow restriction
- hydraulic cold-start accelerator

is being installed for the first time on a direct-injection engine.

BOSCH

Printed in the Federal Republic of Germany

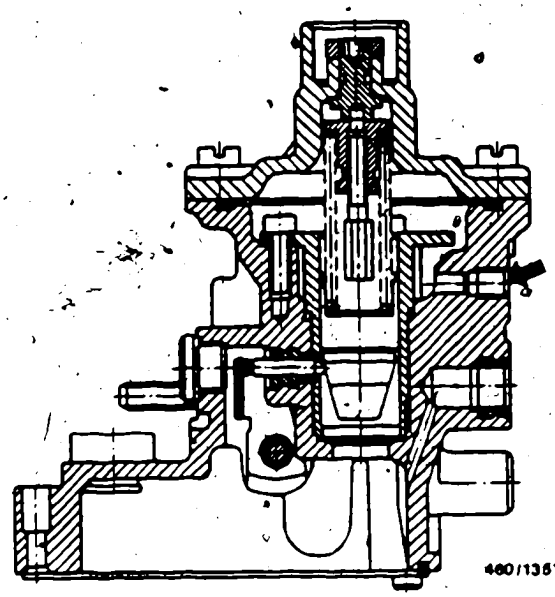
F25



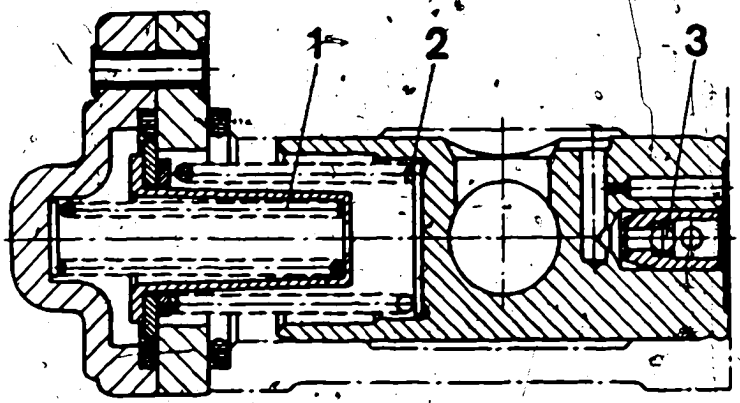
1 = Piston 2 = Adjusting pin

2. Functional description of hydraulically actuated torque control

The pump interior pressure, which rises linearly as a function of engine speed, is applied to a spring-loaded piston (see picture, arrow). As in the case of the manifold-pressure compensator, the reaction of the piston is converted by a cone into a sliding motion, i.e. as the piston moves, the adjusting pin slides over the cone. Consequently, the full-load characteristic is corrected from falling to slightly rising (negative full-load torque control).



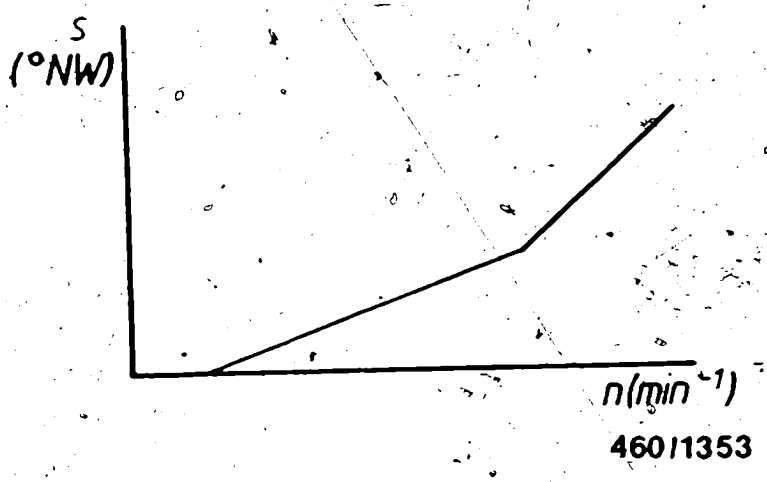
When cold-starting, the pump interior pressure rises, controlled by the hydraulic cold-start accelerator. To compensate for the increased pressure, pressure is directed via a connecting line from the cold-start accelerator to the spring side of the hydraulically-actuated torque-control piston (see picture, arrow). This prevents a reaction of the torque-control piston during the cold-start phase, thus preventing undesired generation of smoke due to too high an injected fuel quantity.



1 = Timing-device cover with preloaded spring
2 = Timing-device spring
3 = Non-return valve

3. Timing device with 2-spring design and non-return valve

Construction:
The version of timing device consists of timing-device cover with preloaded spring, spring in timing-device piston and a non-return valve.



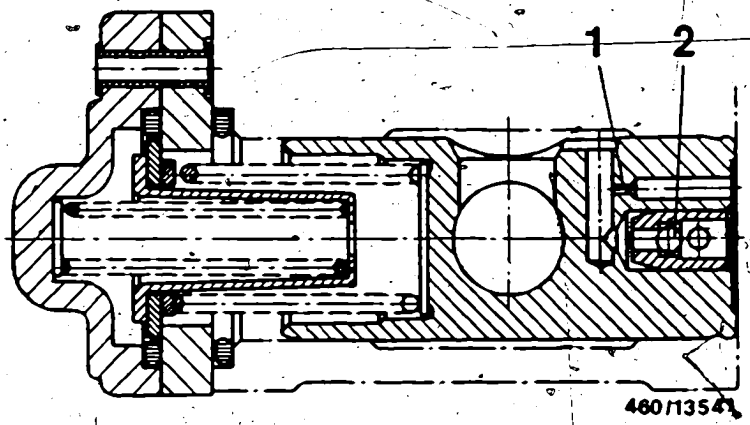
460/1353

s = Timing-device travel
n = Engine speed

3.1 Functional description of 2-spring system

The timing-device springs are connected in series as regards their effect. The spring in the timing-device cover has a higher preload.
According to the low preload of the spring in the timing-device piston, the piston moves only against this spring up to a certain engine speed.
As of this engine speed (kink in curve), the force of the spring in the timing-device piston reaches the preload force of the spring in the timing-device cover, and both springs work together.

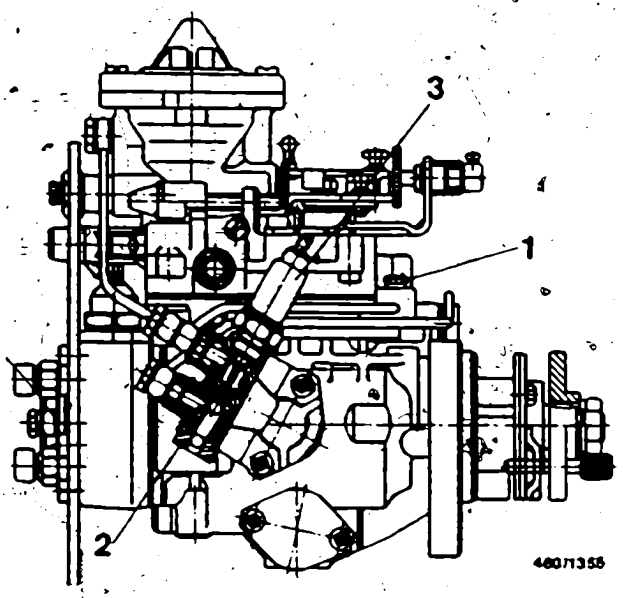
Since these springs act in series, the result is a lower constant spring rate than the spring rate of the spring in the timing-device piston.
This working-together of both springs results in a steeper timing-device characteristic and thus in improved adaptation of the injection timing to the engine at higher engine speeds.



1 = Restriction
2 = Non-return valve

3.2 Operation of non-return valve with restriction

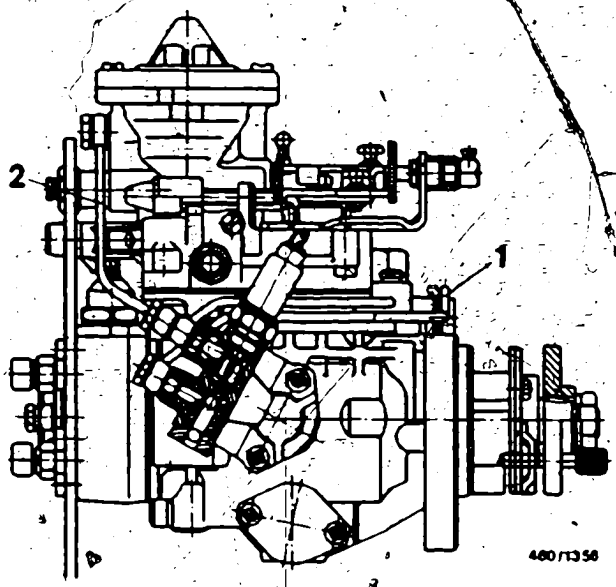
Since the restoring moments (vibrations) are very high with this fuel-injection pump, the timing-device piston has had to be provided with a small restriction. The additional installation of a non-return valve in the timing-device piston results in fast adjustment of the piston.
This valve opens when the piston is moving and closes during injection.



1 = Pressure-control valve
2 = Pressure-holding valve (ball valve)
3 = Expansion element

4. Construction of hydraulic cold-start accelerator

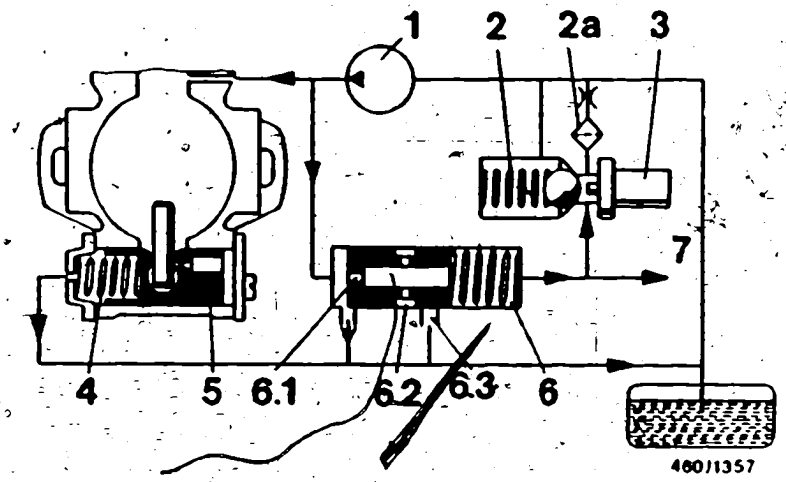
The hydraulic cold-start accelerator consists of a pressure-control valve, pressure-holding valve (ball valve) and an electrically heated expansion element.



1 = Inlet connection
2 = Line to spring side of hydraulically actuated torque control

4.1 Design

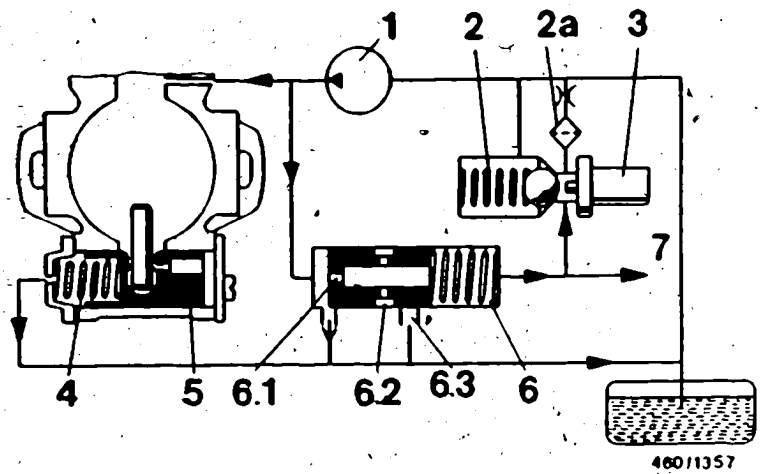
Contrary to the normal design of the hydraulic cold-start accelerator which is mounted on the timing device, this cold-start accelerator is on the side of the pump housing and has two additional connecting lines. One line leads to the inlet connection of the pump; and the other leads to the spring side of the hydraulically actuated torque control. The pump interior pressure is compensated for via this line when cold-starting (hydraulic cold-start accelerator is effective)(smoke-free combustion).



1 = Supply pump
2 = Pressure-holding valve (ball valve)
2a = Restriction
3 = Expansion element
4 = Timing-device spring
5 = Timing-device piston
6 = Pressure-control valve
6.1 = Restriction bore
6.2 = Annular groove
6.3 = Transverse bore
7 = Line to torque control

4.2 Functional description of hydraulic cold-start accelerator

Controlled by the pressure-control valve, the supply pump generates an engine-speed-dependent pressure. This pressure forces the timing-device piston against the timing-device spring, thus adjusting the start of injection as a function of engine speed.
For cold-starting, the injection timing is to be advanced. This advance is achieved as follows.
A partial quantity flows off through the restriction bore in the pressure-control valve.



1	= Supply pump	5	= Timing-device piston
2	= Pressure-holding valve (ball valve)	6	= Pressure-control valve
		6.1	= Restriction bore
2a	= Restriction	6.2	= Annular groove
3	= Expansion element	6.3	= Transverse bore
4	= Timing-device spring	7	= Line to torque control

The pump interior pressure is raised by a downstream pressure-holding valve (ball valve) and restriction, and the desired pressure characteristic is obtained. After the engine has been started, the pressure-holding valve is opened after a certain time by the electrically heated expansion element.
The fuel flows off at zero pressure and the advancing by the timing device is switched off.

NEW PRODUCT

Register 40...46, 58
File Identity VDT-I-460/8 En

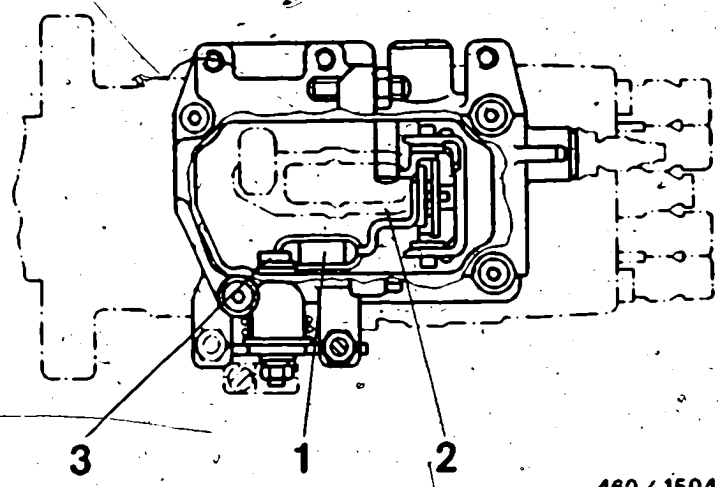
DISTRIBUTOR-TYPE FUEL-INJECTION PUMP WITH NEW GOVERNOR SYSTEM

05.1986

General

To improve the operating conditions during the warm-up phase of the engine (e.g. on VW Golf and Jetta as of 1986 model year), a distributor-type fuel injection pump with

- housing-rigid idle spring (LFG) and
- idle-speed increase, coupled with KSB timing device has been installed.

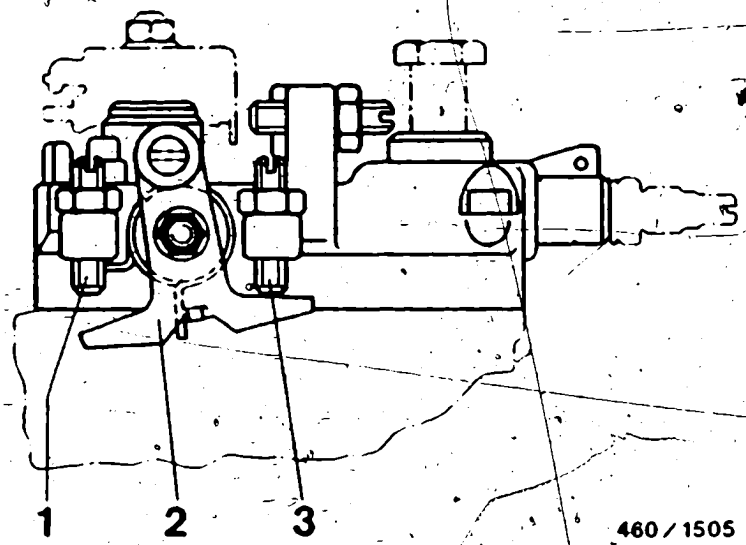


460/1504

1 = Idle spring
2 = Part-load/maximum-speed governor spring
3 = LFG stop lever

In the new governor system with housing-rigid idle spring, the idle spring is separate from the other governor springs that determine the drive-ability and is flanged onto the LFG stop lever on the side of the pump housing cover.

This means that the idle delivery is adjustable irrespective of the residual delivery.



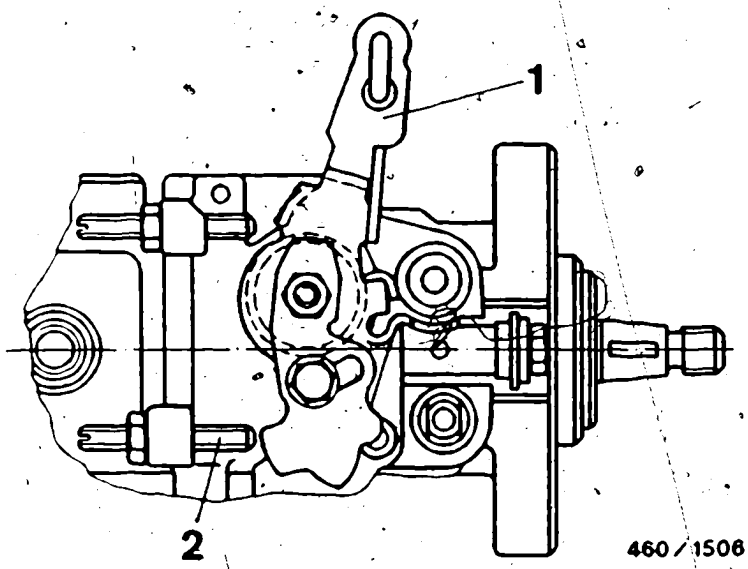
460/1505

1 = Idle-stop screw
2 = LFG stop lever
3 = Stop screw for increased idle

The idle speed and the injected quantity at idle are adjusted by the LFG stop lever on the side of the pump housing cover.

If the stop lever is up against the stop screw for increased idle, a controlled idle-speed increase is obtained via the separately mounted idle spring.

G10



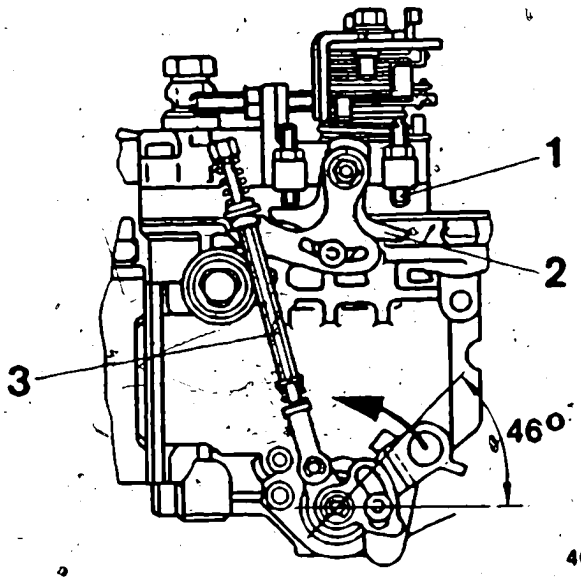
1 = Speed-control lever
2 = Residual-delivery adjusting screw

Irrespective of the position of the LFG stop lever, the desired driving state is selected via the speed-control lever.

Note:

In this version, the previous idle-stop screw is replaced by the residual-delivery adjusting screw, which must not be adjusted.

G11



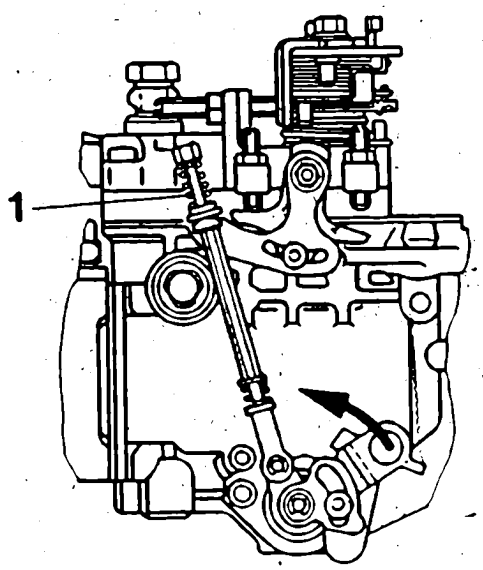
460/1507

1 = Stop screw for increased idle
2 = LFG stop lever
3 = Connecting rod

Functional description of housing-rigid idle spring with idle-speed increase coupled with KSB timing device

When the KSB timing-device lever is actuated up to the pressure point (timing-device stroke starts approximately at 46° position of timing-device lever), the LFG stop lever is brought up against the stop screw for increased idle via the connecting rod.

G12



1 = Compression spring

As the KSB timing-device lever is further actuated, the KSB (cold-start accelerator) is activated and the compression spring on the connecting rod is overcome.

This results in idle increase and operation of the timing device.

Published by:

Robert Bosch GmbH
Division KH
After-Sales Service Department for
Training and Technology (KH/VSK)

Please direct questions and comments concerning the contents to our authorized representative in your country.

G13

40...46, 58

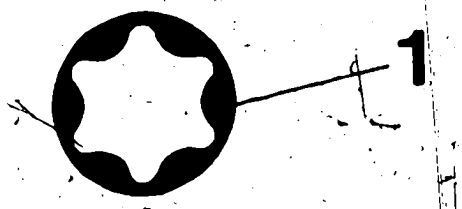
VDT-I-460/1001 En

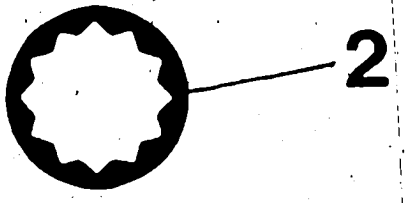
11.1984

supersedes edition 7.1981

SCREWDRIVER BITS FOR SCREWS WITH SPECIAL HEADS

Distributor-type fuel-injection pump VE..





1 = Recessed TORX head
2 = Internally serrated head XZN

1. Screws with recessed TORX head (M 5 and M 6)

This type of screw is being introduced step-by-step on all VE pump types. This screw is used for fastening the hydraulic head, housing cover, timing-device cover and manifold-pressure-compensator cover.

BOSCH

Geschäftsbereich KH Kundendienst Kraftfahrzeug-Ausrüstung
© by Robert Bosch GmbH Postfach 50 D 7000 Stuttgart 1 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

Suitable screwdriver bits for torque wrenches (1/2" square) are commercially available.

Designation:

Bit with 1/2" square drive for

Recessed TORX head screws T 30

Hahn & Kolb, Part no. 52 518 - 030
Hazet, Part no. 992-T30
Wera-Kraft, Part no. 767 C-TX 30

Recessed TORX head screws T 27

Hahn & Kolb, Part no. 52 518 - 027
Hazet, Part no. 992 - T27
Wera-Kraft, Part No. 767 C-TX 27

2. Screws with internally serrated head XZN (M 6)

This type of screw is used on some types of VE distributor pumps (e.g. for IHC engines) for fastening the timing-device cover. Suitable screwdriver bits for 1/2" square are likewise commercially available.

Designation:

Bit with 1/2" square drive for

Internally serrated head screws M 6

Hahn & Kolb, Part no. 52 516-060
Hazet, Part no. 990-6
Wera-Kraft, Part no. 760 C-M 6/52

Obtainable, for example, from: Hahn & Kolb
Postfach 333
7000 Stuttgart 1

Published by:
Robert Bosch GmbH
Division KH
After-Sales Service Department for
Training and Technology (KH/VSK)

Please direct questions and comments concerning the contents to our authorized representative in your country.

TEMPERATURE INDICATOR

VDT-I-460/127 En

9.1982

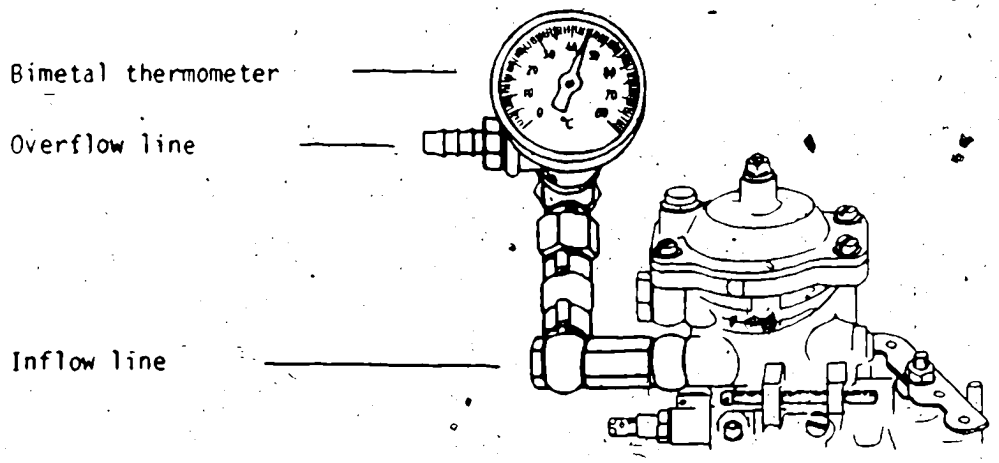
for determining the calibrating oil temperature at the injection-pump overflow of VE..- distributor pumps

0 460 4..

The increasingly stringent requirements placed upon the adjustment and testing of VE pumps necessitates, among other things, the precise compliance with a specified calibration-oil temperature.
Up till now, the temperature of calibration oil entering the pump was measured and had to be maintained by the mechanic at 40 + 5 °C. The new Test Specs issued upon the conversion to the ISO calibration oil specify a temperature at the overflow of 45 ± 3 °C.

For this reason, when a VE pump is tested a temperature indicator must be connected in at the VE-pump overflow in order that the calibration-oil temperature actually present in the distributor pump can be measured and kept constant by means of appropriate measures.

Temperature indicator Part Number 1 687 230 029 comprising the following parts:



The overflow temperature of the calibration oil is dependent upon the pump speed, e.g. the temperature drops when the pump speed is low and it rises at higher pump speeds. This means that before every delivery measurement the calibration oil and pump, if necessary, have to be warmed-up or cooled-down. The temperature in the tank, though, during this process must be maintained at 35 °C.

BOSCH

Geschäftsbereich KH Kundendienst, KH-Ausrüstung
© by Robert Bosch GmbH D-7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

In order to maintain the overflow temperature at 45 ± 3 °C during measurement and testing, it is necessary that the order of the Test Steps in Section 1 "Setting Values" of the Test Specifications Sheet is changed as shown below (the points concerned are underlined). The Test Step sequence in Section 2.3 remains unchanged.

1.	Setting values	Speed min^{-1}	Setting values	Charge-air pressure (bar)	Delivery scatter cm^3
1.1	Timing-device travel		mm		
1.2	Delivery-pump pressure		bar (kgf/cm^2)		
1.3	Full-load delivery with charge-air pressure		cm^3/1000 strokes		
	Full-load delivery without charge-air pressure		cm^3/1000 strokes		
1.4	Idle regulation		cm^3/1000 strokes		
1.5	Maximum-speed regulation		cm^3/1000 strokes		
1.6	Start		cm^3/1000 strokes		
1.7	Load-dependent port closing		-		

Test sequence

Section "1. Setting values"

1. Drive the pump at the upper rated speed until the overflow temperature has reached approx. 46 °C. Open or close the throttle (fitted in the injection-pump test bench) in order at the same time to control the inlet temperature.

2. While measurement is being carried out, the tank temperature is to remain at approx. 35 °C.

3. Set the pump in accordance with Section "1. Setting values".

4. If the overflow temperature (45 ± 3 °C) is exceeded or dropped below during the delivery measurement, the pump and calibration oil must cooled down by running briefly at the lower rated speed or they must be warmed up by running at the upper rated speed. While this takes place delivery measurement is to be stopped.

Section "2.3 Delivery quantities"

If necessary, before starting the delivery-quantity measurements, warm up the calibrating oil to the lower limit of the overflow temperature by running the pump at upper rated speed. The temperature of the overflow calibration oil can be maintained at the specified 45 ± 3 °C by complying with the test-step sequence as given above.

Please direct questions and comments concerning the contents to our authorized representative in your country.

PLUNGER AND CONTROL-COLLAR SEIZURE ON VE-DISTRIBUTOR PUMPS CAUSED BY FUEL DEPOSITS

Occasion has arisen for us to provide you with the following information regarding the handling of defective VE distributor pumps (this applies particularly to Warranty Claims).

Deposits resulting from dirty or contaminated fuel can lead to a reduction in clearances and cause plunger and control-collar seize-up.

On the defective pumps, the deposits on the drive shaft, on the cam-plate track, as well as on the control collar and plunger could be clearly seen with the naked eye. There were also deposits on the respective bores. The deposits concerned form a hard grey-brown coating which cannot be wiped off and which mainly forms on bright steel surfaces.

Analysis of the coating showed that the deposits were composed of inorganic sulphates. These originate from fuels which have been contaminated with sulphuric acid.

Furthermore, it cannot be completely ruled out that the fuel had been mixed with waste engine oil and contaminated in this manner.

Due to the fact that we have no influence on clean fuel being used, we must point out that Warranty Claims cannot be accepted for defects which are caused by fuel deposits.

BOSCH
Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

RE-USING DELIVERY-VALVE HOLDERS

MODIFIED TORQUE ON DISTRIBUTOR-TYPE FUEL-INJECTION PUMPS VE.. and VA..

VDT-I-460/132 En
2.1984
Supersedes Ed. 10.1983

Removed (deformed) delivery-valve holders may only be re-used under the following conditions:

* the sealing edge is not damaged or cracked;
* the sharp edge on the shaped seal is only deformed slightly and is without visible shoulder;
* the valve holder is not seized in the delivery-valve holder.

When exchange-scheme fuel-injection pumps are repaired, delivery-valve holders which are rusty on the outside or which are damaged must at all costs be replaced.

* The tightening torque of used delivery-valve holders is

  38...42 Nm

* The tightening torque of new delivery-valve holders when these are screwed into a new distributor head is

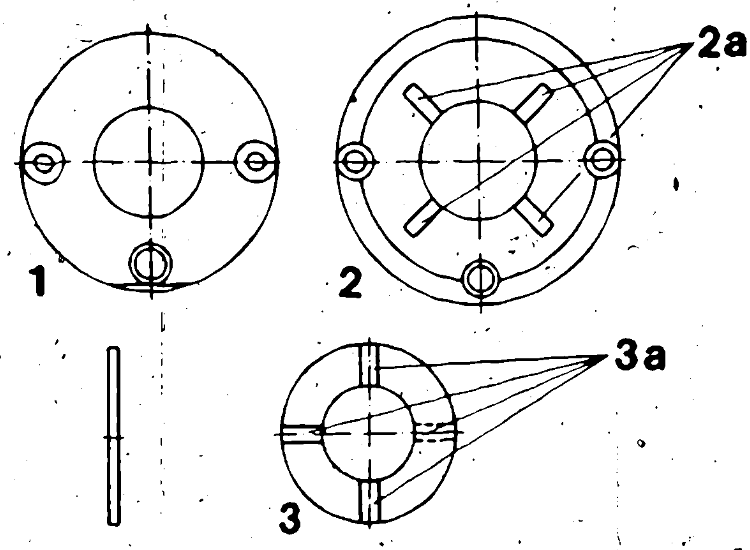
  38...48 Nm

Please direct questions and comments concerning the contents to our authorized representative in your country.

BOSCH

Geschäftsbereich KH Kundendienst Kfz-Ausrüstung
© by Robert Bosch GmbH D-7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

MODIFICATION TO THE SLOTTED DISK AND THE SUPPORT RING ON VE DISTRIBUTOR FUEL-INJECTION PUMPS



1 = Support ring, old version
2 = Support ring, new version
2a = Slots (new)
3 = Slotted disk, old version
3a = Slots (omitted)

The slotted disk (position 17) and the support ring (position 9) on the VE distributor fuel injection pumps have been modified such that in future the slots are no longer in the slotted disk but have been transferred to the support ring (see figure).

During customer service, when assembling slotted disks and support rings, the following points must be taken into account:

It is permissible to assemble a slotted support ring (new version) together with an old version disk with slots. On the other hand, it is not permissible to assemble an old version support ring without slots together with a new version disk without slots.

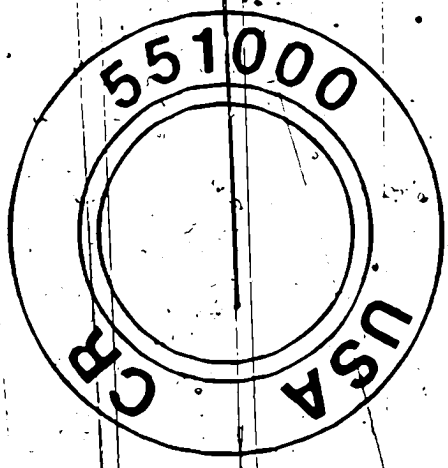
The service parts lists for the VE distributor injection pumps concerned will be amended accordingly.

Please direct questions and comments concerning the contents to our authorized representative in your country.

RADIAL-LIP-TYPE OIL SEAL 1 460 283 301 FOR DISTRIBUTOR-TYPE PUMPS

VDT-I-460/143 En

12.1985



In particular cases, despite allowable tilting play, there may be leaks at the drive shafts of distributor-type pumps. This is caused by cracks in the circumferential direction of the radial-lip-type oil seal 1 460 283 301 with delivery designation "CR 551 000 USA". The delivery designation is marked on the end face of the metal jacket (see picture).

1 Technical Bulletin

If a distributor-type pump is brought in with leaks at the drive shaft, proceed as follows:

- Measure tilting play of drive shaft.
- If the tilting play is within the specified tolerance (max. 0.25 mm in both directions), replace the radial-lip-type oil seal. Replacement can be performed with service tool KDEP 1113 without dismantling the pump.

Replacement of the radial-lip-type oil seal is to be performed free of charge during the warranty period. After expiration of the warranty period, a goodwill application may be made.

Since radial-lip-type oil seals with delivery designation "CR 551 000 USA" may no longer be installed, please check your inventory of these oil seals. Any existing inventories should be sent in to KH/QSG. They will be replaced immediately free of charge.

Repairs and returns from any existing inventories should be reported through the usual channels with reference to this Technical Bulletin.

Procedure:

Federal Republic of Germany:

With warranty and goodwill application - Germany G21 and delivery slip KH/VKD3-15 333 to

Robert Bosch GmbH
KH/QSG
Auf der Breit 4
7500 Karlsruhe 41

Other countries:

Through RG/AV with warranty and goodwill application - outside Germany G21 and delivery slip to

Robert Bosch GmbH
KH/LAV2-Auspackraum
zur Weiterleitung an KH/QSG
Auf der Breit 4
D-7500 Karlsruhe 41

Published by:

Robert Bosch GmbH
Division KH
Technical After-Sales Service (KH/VKD2)

Please direct questions and comments concerning the contents to our authorized representative in your country.

New Product

VDT-I-460/3 En
10.1979

Distributor-Type Fuel-Injection Pump

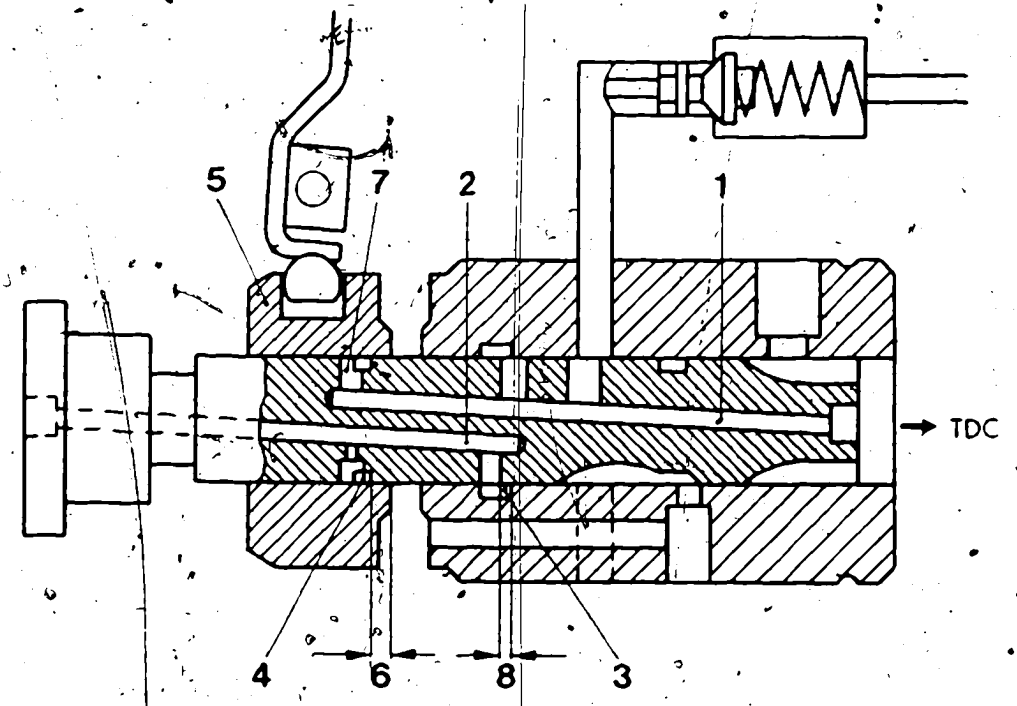
VE..F.. 0 460 4..

with quiet-idle device

The function of the VE..F.. distributor-Type fuel-injection pump is described in the Technical Bulletin VDT-I-460/1.
A model of this injection pump equipped with a quiet-idle device has now been released.

Quiet-idle device

On present-day Diesel engines, in order to improve the composition of the exhaust gas the fuel is injected into the combustion chamber in as short a time as possible, i.e. high rates of injection are used.
A high rate of injection is noticeable, depending upon system design and particularly in the idle range, in the form of idle-knock.
By increasing the duration of injection in the idle range for quieter combustion is achieved and idle-knock prevented.



BOSCH
Geschäftsbereich KH Kundendienst Kfz-Ausrüstung
© by Robert Bosch GmbH D 7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

Construction and operating principle of the quiet-idle device

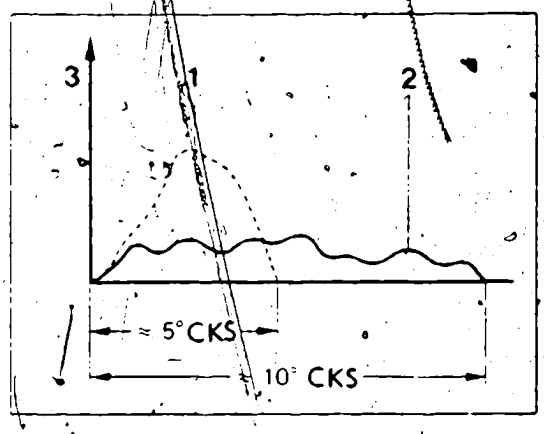
The plunger of the distributor-type fuelinjection pump with integrated quiet-idle device has 2 longitudinal bores (1) and (2) which are connected by an annular groove (3).

The longitudinal bore (2) has a spill section (4), under which there is a restrection in the area of the control collar (5).

When the plunger moves in the direction of TDC, the spill section (4) belonging to longitudinal bore (2) leaves the control collar (5) earlier than the spill section (7) belonging to the longitudinal bore (1), that is, after plunger travel (6).

Due to the fact that the bores (1) and (2) are connected by the annular groove (3), part of the fuel leaks from the high-pressure chamber into the interior of the pump upon the spill section (4) leaving the control collar (5) before spill section (7).

The result is a reduction in the rate of injection (i.e. less fuel is injected per degree crankshaft). The same quantity of fuel is injected but spread across almost twice the number of crankshaft degrees.



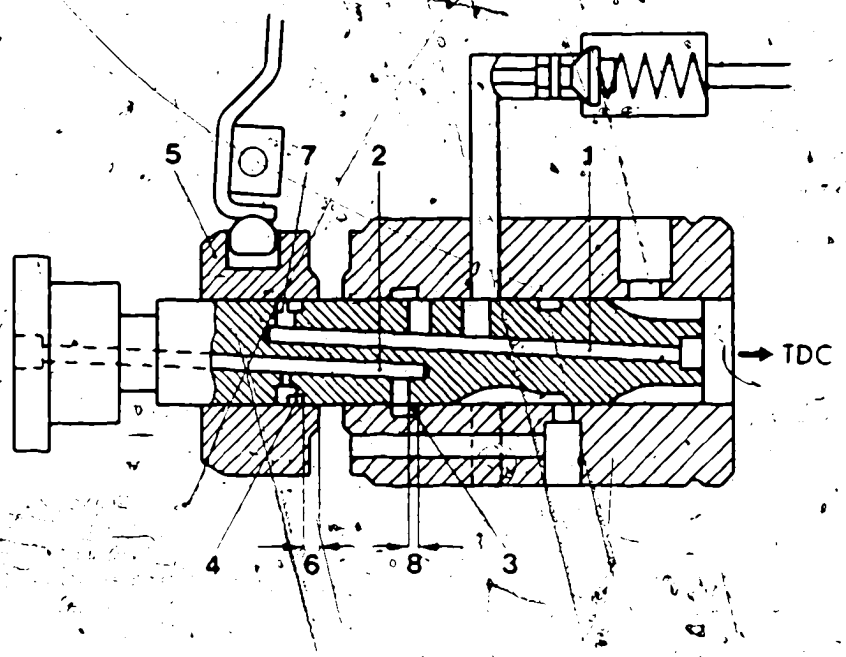
1 = Nozzle-needle lift without quiet-idle

2 = Nozzle-neddle lift quiet-idle

3 = Injected fuel quantity

In the full-load range the control collar is nearer to the hydraulic head.

This means that the distance (8) is less than the distance (6). When the plunger now moves in the TDC direction, the annular groove (3) is covered before the spill section (4) emerges from the control collar (5). In other words the connection between bore (1) and (2) no longer exists, and the result is that the quiet-idle device is ineffective in the full-load range.

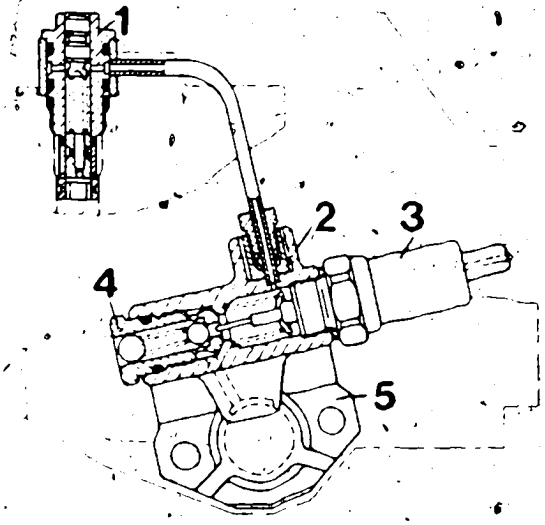


Distributer-type fuel-injection pump VE..F.. with hydraulic cold-start accelerator (KSB)

General

For a better cold start and consequent running-up of the diesel engine, it is an advantage if the injection timing point can be advanced.
However, this must only be done with a cold engine.
The shifting of the injection timing point in the "advanced" direction is carried out with a hydraulic cold-start accelerator (KSB).

Construction of the hydraulic cold-start accelerator (KSB) with its main components

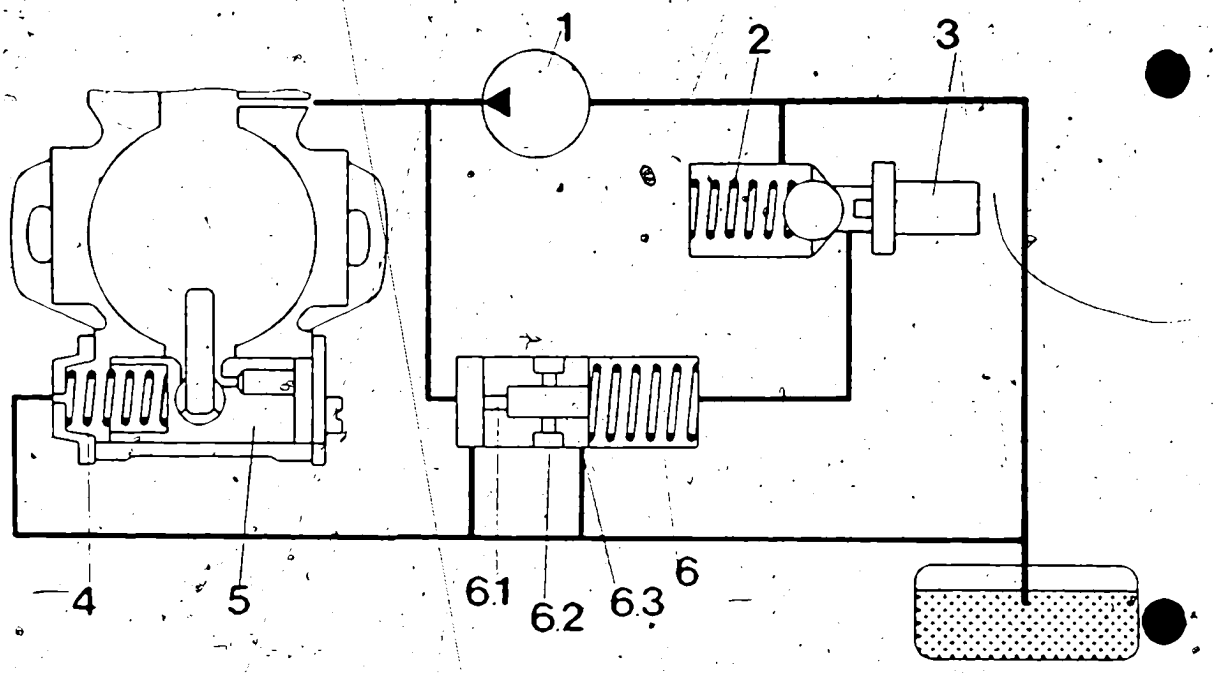


1 = pressure regulator
2 = pressure maintaining valve
3 = expansion element
4 = ball valve
5 = KSB valve

The cold-staft accelerator contains two component groups

- Pressure regulator
- KSB valve

These are connected with an electric cable.
An electrically-heated expansion element is fitted in the KSB valve. The expansion element controls the pressure.



1 = supply pump
2 = pressure maintaining valve
3 = expansion element
4 = timing-device spring
5 = timing-device piston
6 = pressure regulator
6.1 restriction bore
6.2 ring groove
6.3 cross hole

Method of operation

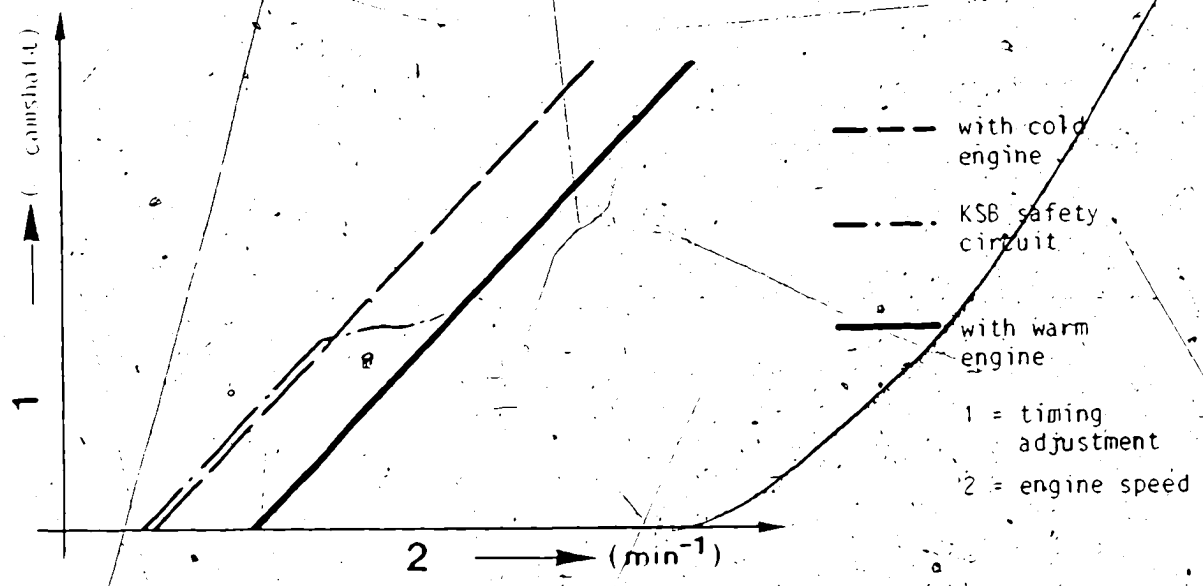
The supply pump (1), controlled by the pressure regulator (6), creates a pressure dependent on the engine speed.
This pressure causes the timing-device piston (5) to press against the timing-device spring (4) and the start of injection is adjusted in accordance with the engine speed.

During a cold start the injection timing point is moved in the "advanced" direction. This move is carried out as follows:

The piston in the pressure regulator (6) has a restriction bore (6.1) along its length, through which a certain quantity can flow to the KSB valve.
When the engine is cold the pin of the expansion element (3) is lifted from the ball valve (2). This means that this quantity must open the ball valve in order to flow away.
To do this the opening pressure of the ball valve must be overcome.
This additional pressure affects the spring side of the piston in the pressure regulator (6), which results in a correspondingly higher pressure on the timing-device piston and in a certain movement in the "advanced" direction.

When the engine is started, the heating of the expansion element is switched on at the same time.
If, after starting, the engine has reached a sufficient operating temperature, the expansion element expands and the pin opens the ball valve.
The pressure on the spring side of the piston in the pressure regulator drops and the advance movement of the timing device is switched off.

The following diagram represents the injection-timing point curve of a fuel-injection pump with hydraulic KSB, depending on engine speed, for a warm and for a cold engine.



The broken line occurs with a cold engine and with hydraulic KSB as a result of the higher pressure on the timing-device pistons.
A safety circuit in the pressure regulator prevents the engine from working with too advanced an ignition timing point, even at higher speeds (more noise develops and over a longer period the engine will be thermally overloaded).
The safety circuit in the pressure regulator (6) consists of a ring groove (6.2) on the outer diameter and is connected to the center bore with cross holes. There are cross holes (6.3) above the ring groove in the pressure regulator (6). After a certain stroke of the piston (corresponding to a certain speed) the piston with the ring groove opens the area above the piston.
This causes the pressure to fall and, below this speed, results in a curve similar to that with a warm engine.

OMISSION OF SUPPLY PUMP PRESSURE TEST
on distributor-type fuel-injection pumps VE..F..

VDT-I-460/125 En
4.1982

The supply pump pressure is of secondary importance when assessing the operation of a VE..F.. distributor-type fuel-injection pump. The fuel delivery and the timing-device travel are the decisive factors and must lie within the specified tolerance.
The checking values (values in parentheses) contained in all existing test-specification sheets under test section 2.2 for the supply pump pressure are thus no longer valid.

The checking of the supply pump pressure is, therefore, to be discontinued with immediate effect when performing the as-received inspection (warranty assessment) on defective injection pumps.

In the case of warranty inspections in the after-sales service, all check measurements given in the test specification sheet and test instruction manual are to be performed, with the exception of the above-mentioned supply pump pressure checking value, in order to locate the decisive operational defect which led to the complaint.
Only this defect should then be stated in the warranty report.

In case of inquiries, please contact your local representative.

BOSCH

Geschäftsbereich Kundendienst Kfz-Ausrüstung
© by Robert Bosch GmbH D-7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

H3

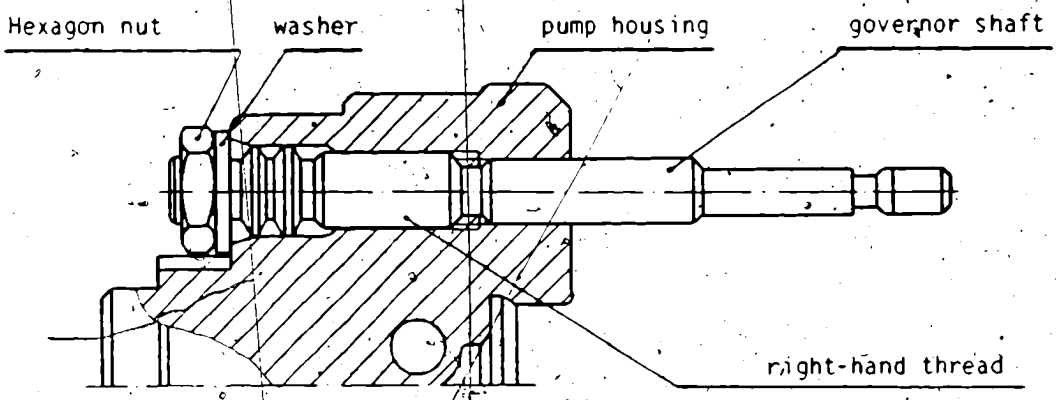
CHANGING THE THREAD ON THE GOVERNOR SHAFT 40-46, 58

Distributor-type fuel-injection pumps VE .. F .., 0 460 .. VDT-I-460/130 En

with register diameter 50 mm .4.1983

As from FD 151 the thread of the governor shaft and the pump housing on all clockwise rotating distributor-type fuel-injection pumps with register diameter 50 mm was changed from a left-hand to a right-hand thread.

The slotted nut used up till now on distributor-type fuel-injection pumps is replaced by the hexagon nut 1 463 300 304 and washer 2 916 012 017.

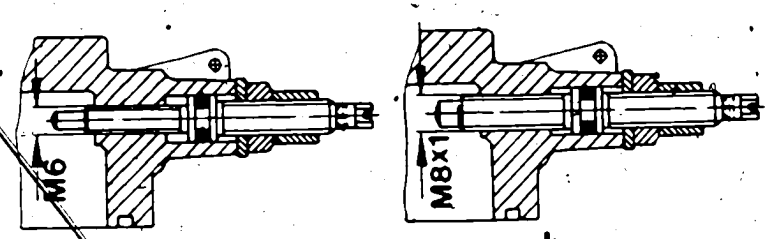


The part number of the pump housing and of the governor shaft are to be found in the latest service-parts list.

BOSCH Geschäftsbereich KH Kundendienst, KH-Ausrüstung
© by Robert Bosch GmbH D-7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

ALTERATION TO THE HOUSING COVER DISTRIBUTION-TYPE-FUEL-INJECTION PUMP VE..F.. 0 460 4..

Register 40...46, 58
File Identity VDT-I-460/141 En
4.1987
Replaces 9.1985 ed.



460/1701

In the case of all distributor-type fuel-injection pumps VE..F.., the screw thread of the threaded pin in the housing cover is being changed from M6 to M8x1.

a = Previous version
b = New version

The previous housing covers with M6 screw thread will no longer be able to be used as service parts once stocks have been used up and may no longer be supplied for this purpose.

H5

As a result, the part numbers of the housing covers will change as follows:

From housing cover M 6	to housing cover M8x1
1 465 530 304	1 465 530 571
.. 307	.. 580
.. 310	.. 573
.. 311	.. 595
.. 333	.. 539
.. 347	.. 609
.. 353	.. 631
.. 368	.. 611
.. 370	.. 613
.. 399	.. 669
.. 436	.. 575
.. 445	.. 644
.. 483	.. 582
.. 552	.. 671
.. 570	.. 309
.. 577	.. 490
.. 603	.. 380
.. 605	.. 440
.. 615	.. 422
.. 617	.. 442
.. 624	.. 390

When the new housing-cover version is used, the part number of the threaded pin for adjusting the full-load delivery changes from

(M 6) 1 463 526 339, ..345 to (M8x1) 1 463 402 330
(M 6) .. 353, ..356 to (M8x1) .. 334

The M6 threaded bolts used up to date will still retain their validity as service parts.

Published by:
ROBERT BOSCH GMBH
Division KH
Technical After-Sales Service (KH/VKD 2)

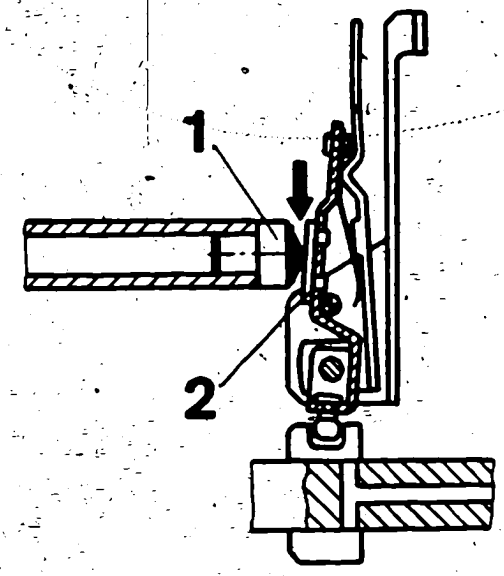
Please direct questions and comments concerning the contents to our authorized representative in your country.

40...46, 58

I-460/145 En

2.1986

UPRATED STARTING LEVER AND PLUG IN VE..F.. PUMPS



1 = Plug
2 = Riveted-on plate
To prevent wear at the contact point between plug (governor sleeve) and starting lever, a harder material (DMO 5) is being used.
This prevents the plug working into the starting lever.

1 Technical Bulletin

BOSCH
Geschäftsbereich KH, Kundendienst Kraftstoffeinspritzausrüstung

Starting levers and plugs made of material DMO 5 can be identified by the following features:
- Sleeve plug with grooves (see picture, arrow)
- Starting lever with riveted-on plate

If repairing, under no circumstances install a hard plug made of DMO 5 material with a soft starting lever (without riveted-on plate) or vice versa.

Published by:

Robert Bosch GmbH
Division KH
After-Sales Service Department for
Training and Technology (KH/VSK)

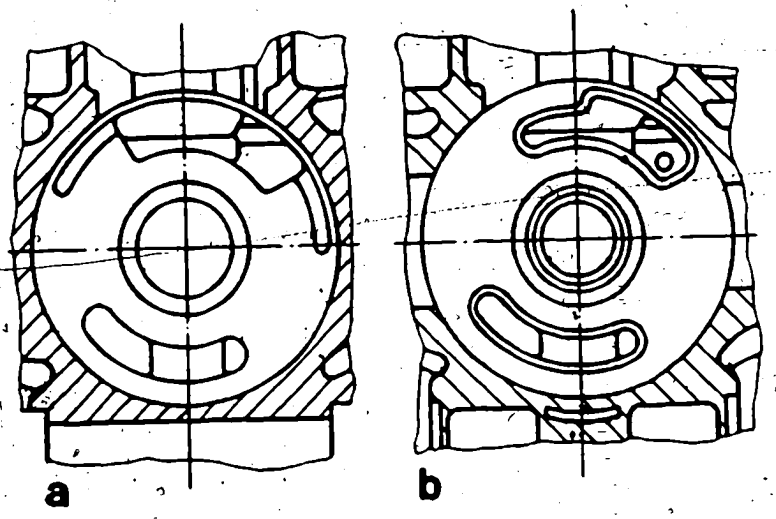
Please direct questions and comments concerning the contents to our authorized representative in your country.

40...46,·58

VDT-I-460/144 En

2.1986

PUMP-HOUSING MODIFICATION ON DISTRIBUTOR-TYPE FUEL-INJECTION PUMPS FOR IHC



a = Previous version b = New version

On distributor-type injection pumps VE...F.. for IHC, the shape of the fuel inlet in the pump housing (Niere) has been modified as of FD 448 (see picture).

This modification also calls for a modification to the supply pump and the support ring.

1	Technical Bulletin	➡

If, when repairing, a pump housing of the new version is used, it is necessary also to use the support ring (Item 9) and the supply-pump service-parts group (Item 801 or 7) according to the latest service-parts list.
Use of the previous versions of support ring and supply pump will result in no pump interior pressure building up.

Published by:

Robert Bosch GmbH
Division KH
Technical After-Sales Service (KH/VKD2)

Please direct questions and comments concerning the contents to our authorized representative in your country.

40..46, 58

VE FUEL INJECTION PUMP 0 460 494 071, ..114 VDT-I-460/138 En
IN OPEL KADETT/ASCONA-DIESEL 9.1984
Load-dependent injection timing (LFB)
no longer fitted

As from FD 349 (September 83), the load-dependent injection timing (LFB) is no longer fitted to the VE distributor fuel-injection pumps

0 460 494 071 (VE 4/9 F 2300 R '82),
0 460 494 114 (VE 4/9 F 2300 R 82-1)

VE distributor injection pumps which are fitted with load-dependent injection timing can be recognized due to the following features:

- Hole bored through the governor shaft and the collar.
- A second ball is fitted in the pump housing at both the governor shaft in addition to the ball fitted on the side of the pump at the fuel inlet.
- Rotational speed specifications for the adjustment of load dependent injection timing are included in the test spec sheets (point 1.7).

The features are not present with VE distributor pumps not fitted with load-dependent injection timing.

Up to and including FD 351 (in November 83), the VE distributor pumps given above will continue to be fitted with a pump housing which has a ball at both the governor shaft, even these pumps are not fitted with load-dependent injection timing as of FD 349.

1 Technical Bulletin

These pumps are identified by means of a blue paint marking in the vicinity of the ball fitted above the governor shaft.

As of FD 352 (December 83), both the ball and the blue paint marking are omitted.

Those VE distributor pumps on which the load-dependent injection timing is removed during the course of repair, are also to be identified by a blue paint marking in the vicinity of the ball above the governor shaft.

The test specs and the service part lists will be amended accordingly.

Please direct questions and comments concerning the contents to our authorized representative in your country.

40...46, 58

DISTRIBUTOR-TYPE FUEL-INJECTION PUMP
0 460 414 014 (VE4/11F1200R94-2)
in Steyer tractor

VDT-I-460/139 En
11.1984

The Steyer tractor model 8075 with engine WD 411.45/3,45I/47 kW is equipped with the above-mentioned fuel-injection pump.
Some of these VE distributor-type injection pumps have a hydraulic head with delivery valves which do not correspond to the status of the service-parts list.
The part numbers which differ from the service-parts list are as follows:

Designation	Part No.
Hydraulic head (Item 50)	1 468 334 401
Delivery valve (Item 55)	1 468 522 001

The VE distributor-type pumps in question can be recognized by the FD (FD 441) as well as by the letter A on the fastening flange of the pump housing.

When repairing, it is necessary either to change delivery valves and hydraulic head together and to replace them by the service parts given in the service-parts list, or, since the use of the service parts which differ from the service-parts list does not result in any adverse effect on the VE distributor-type pump, to use the above-mentioned service parts which differ from the service-parts list.

BOSCH
Geschäftsbereich KH Kundendienst-Ausbildung Abteilung ...
© by Robert Bosch GmbH Postfach 30 D-7000 Stuttgart 1 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

When setting this VE distributor-type injection pump, however, it is then necessary to perform the following settings which differ from the test-specification sheet:

1. Prestroke setting = 0.5 mm
2. Test specifications Sec. 2.3 = 500 min^{-1}; 57.5-60.5 cm^3/1000 lifts (55.6-62.4) cm^3/1000 lifts

All other settings are to be performed in accordance with the data given in the test-specification sheet.

Responsible:

Robert Bosch GmbH
Division KH
Technical After-Sales Service (KH/VKD 2)

Please direct questions and comments concerning the contents to our authorized representative in your country.

40...46, 58

VDT-I-460/136 En

5.1984

DISTRIBUTOR-TYPE FUEL-INJECTION PUMPS WITH LEAKING CONTROL-LEVER BEARING IN MAN COMMERCIAL VEHICLES

In MAN commercial vehicle engines D 0226 MKF/170 with distributor-type fuel-injection pump 0 460 426 028, VE 6/12 F 1400 R 120 with manifold-pressure compensator it is possible in some cases that after a short operating time the bearing bushing on the control-lever shaft will become worn and begin to leak.

In the event of failure during the warranty period the distributor-type injection pump must be converted to the latest version with extended bearing bushing.

Since the conversion also requires MAN parts it is necessary to obtain the complete conversion kit from your nearest MAN agent. Therefore, please contact your agent and ask him to maintain sufficient stocks of the following parts set:

Bosch distributor-type pump	MAN parts set
0 460 426 028	81.11102-6012

H15

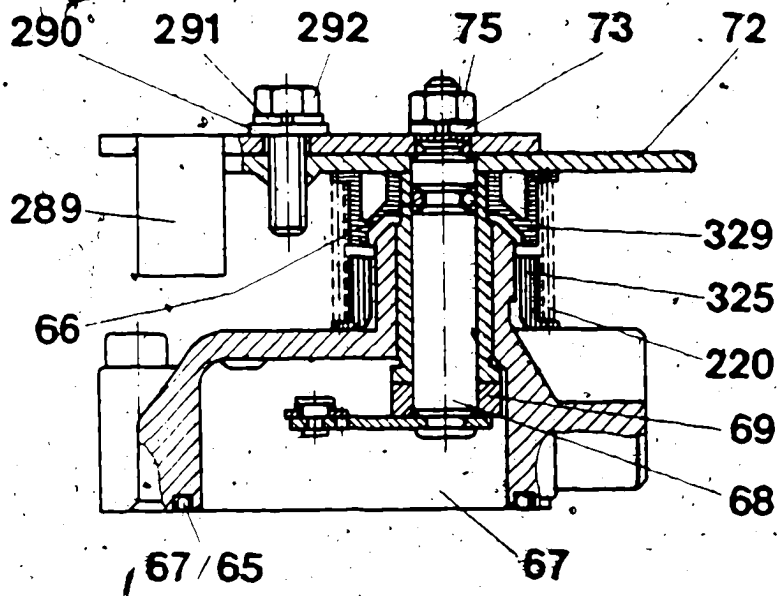
The conversion as well as the costs for setting should be handled with warranty report G21 stating the defect number 35 and referring to this Service Bulletin. For this work we will reimburse you max. 15 work units.

After expiration of the warranty period the conversion is to be carried out subject to payment.

After conversion the MAN customer number on the name-plate of the pump must be changed; there is no change to the Bosch part number.

MAN cust. no. Old	MAN cust. no. New	Bosch part number
- 7535	- 7516	0 460 426 028

As of FD 441 (Jan. 1984) the modifications are incorporated in series production.



66 = O-ring
67 = Manifold-pressure compensator
67/65 = Seal ring
68 = Control shaft
69 = Shim
72 = Control lever
73 = Spring lock washer
75 = Hexagon nut
220 = Cyl. helical coiled spring
289 = Control lever
290 = Plain washer
291 = Spring lock washer
292 = Micro-encapsulated screw
325 = Spring seat (new)
329 = Spring seat

New control-lever bearing with extended bearing bushing

Please direct questions and comments concerning the contents to our authorized representative in your country.

DISTRIBUTOR-TYPE INJECTION PUMP 0 460 426 032

VDT-I-460/134 En
4.1984

VE6/12 F 1400 R.132 FOR MAN COMMERCIAL VEHICLES 12.192 F.. and 14.192 F..

WITH DIRECT-INJECTION ENGINE D 0226 MK

The above-mentioned vehicles with direct-injection engines have a power output of 141 kW (192 HP-DIN). The fuel is injected at a pressure of 200 bar.

This places extremely heavy demands on the distributor-type injection pump and therefore necessitates for the first time the use of extremely strong materials for the drive parts.

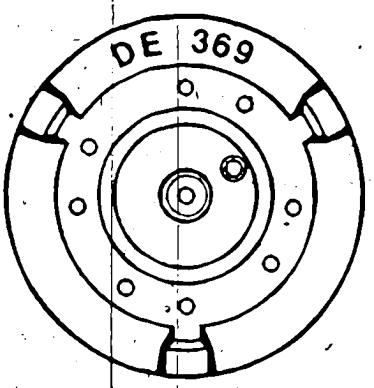
The slotted washer, bearing pin and rollers are made from a special, high-strength steel (DMO 5).

Drive shaft, cam roller ring and cam plate are uprated and have undergone special hardness treatment.

To rule out any confusion with service parts of similar appearance, these parts are identified with "DE" (standing for direct injection) and the last 3 digits of the part number.

In case of repair, use only the parts listed on the microfiche and identified with DE, since otherwise the distributor-type injection pump will fail after a short period in service.

Example:
Cam plate



Published by:

Robert Bosch GmbH
Division KH
Technical After-Sales Service (KH/VKD2)
Please direct questions and comments concerning the contents to our authorized representative in your country.

40...46, 58

DISTRIBUTOR-TYPE FUEL-INJECTION PUMP
0 460 494 138 installed in turbo diesel
VW Golf, Jetta; Audi 80
Interchangeable distributor-type fuel-injection pump

VDT-I-460/142 En
9.1985

The above-mentioned vehicles with distributor-type fuel-injection pump 0 460 494 138 (VE 4/9 F 2250 R 149) as of FD 451 (Nov. 84) have in some cases been equipped with the interchangeable distributor-type pump 0 460 494 134 (VE 4/9 F 2250 R 134-1).
Version .. 134 can be identified by the stop lever and the 2-spring system on the control lever.

The nameplate of pump .. 0 460 494 134 has the nameplate of pump .. 0 460 494 138 bonded over it. These pumps have the serial numbers 00001 to 01800.

The setting of such distributor-type injection pumps on the injection-pump test bench must, therefore, be performed as for pump .. 0 460 494 134.

Likewise, the service-parts list for pump version 0 460 494 134 is valid.

There is no change in the injection timing (0.90 mm ± 0.02 mm stroke ABDC).

Published by:

Robert Bosch GmbH
Division KH
Technical After-Sales Service (KH/VDK 2)

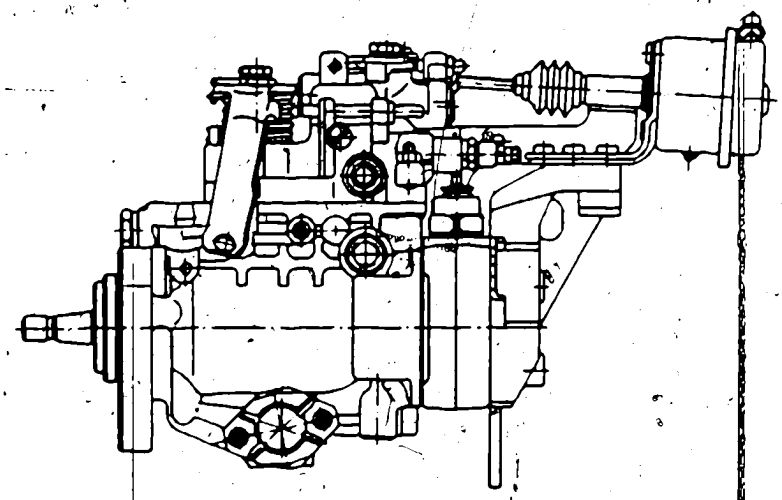
Please direct questions and comments concerning the contents to our authorized representative in your country.

H19

New Product

DISTRIBUTOR-TYPE FUEL-INJECTION PUMP WITH EXTERNAL MANIFOLD-PRESSURE COMPENSATOR (VE..R.170) installed in VW type II turbo diesel (01.85 →)

VDT-I-460/6 En
10.85

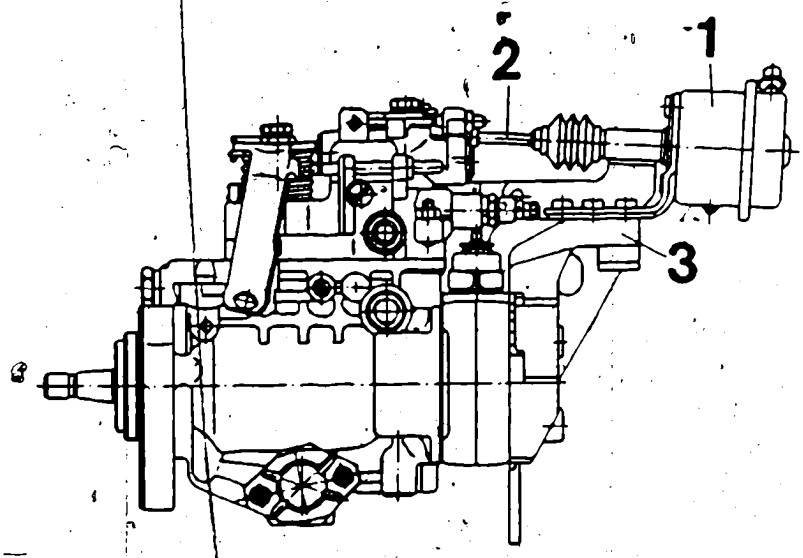


Due to the installation position of the engine in the turbo diesel vehicle, it has been necessary to change the overall height of a hitherto known distributor-type fuel-injection pump with manifold-pressure compensator so that the overall height of the engine is the same as that of the previous naturally-aspirated diesel engine. This has been achieved by lateral mounting of the manifold-pressure compensator on the distributor-type pump while retaining the installation position on the engine.

1	Technical Bulletin	

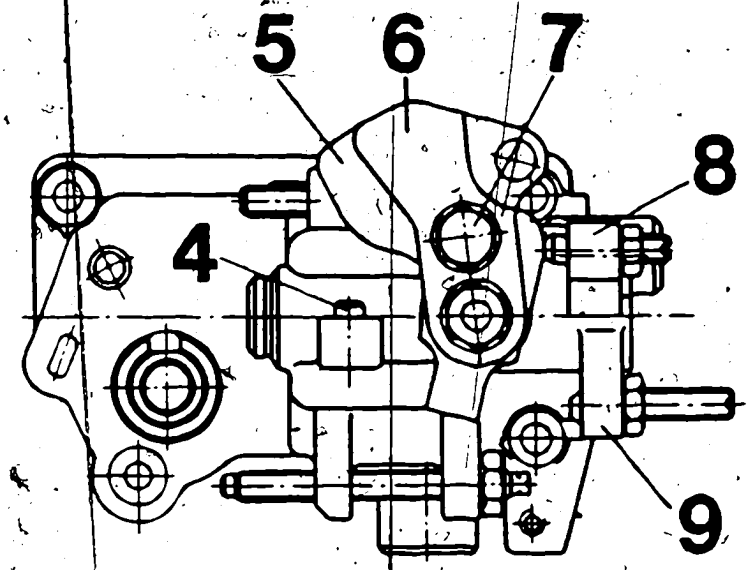
BOSCH

H20



Design of external manifold-pressure compensator

1 = Aneroid capsule
2 = Connecting rod
3 = Support bracket

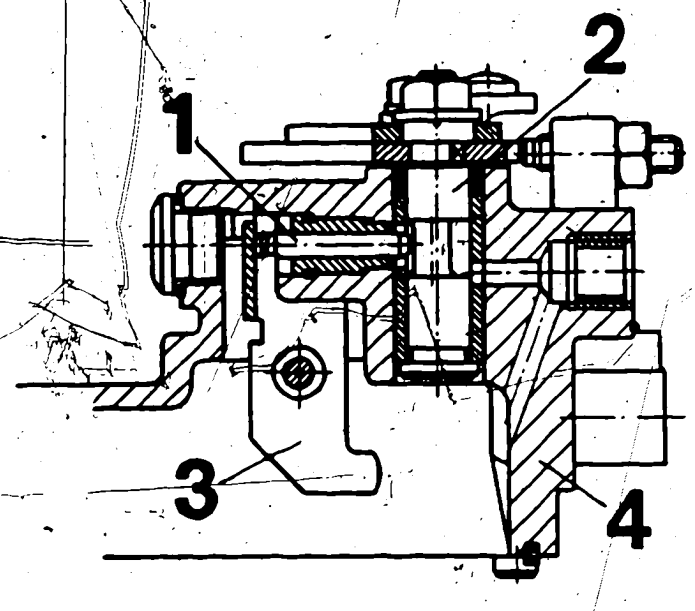


Design of external manifold-pressure compensator (continued)

4 = Full-load charge-air-pressure stop
5 = Manifold-pressure compensator control lever
6 = Manifold-pressure compensator central lever
7 = Hexagon screw
8 = Inducted-quantity stop
9 = Intermediate charge-air pressure stop

Note:

Do not loosen hexagon screw of control lever/central lever while distributor-type pump is mounted on engine since, otherwise, it will be necessary to reset the control lever and central lever with respect to each other on the injection-pump test bench.



1 = Guide pin
2 = Sliding bolt
3 = Control lever
4 = Stop housing

Functional description

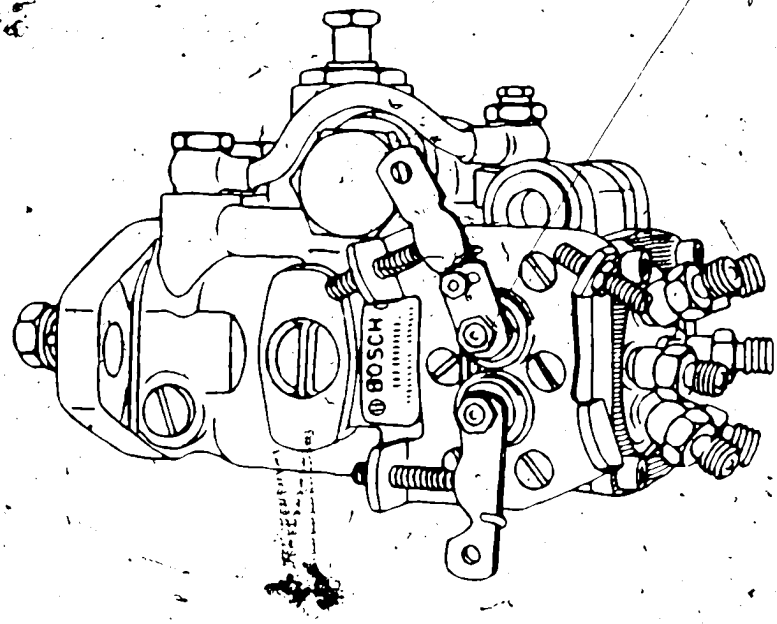
The manifold-pressure compensator (aneroid capsule) is screwed onto the hydraulic head by means of a support bracket.
By means of a connecting rod, the aneroid capsule is connected to the stop housing and, depending on the charge-air pressure, forces the manifold-pressure-compensator control lever in the direction of the full-load charge-air-pressure stop. This rotary motion is transmitted to the eccentric sliding bolt in the stop housing.
A guide pin that engages the sliding bolt thus acts axially on the control lever, limiting the full-load delivery.

Please direct questions and comments concerning the contents to our authorized representative in your country.

BOSCH

VDT-WEP 161/2X EP

INSTALLATION INSTRUCTIONS
INSTRUCTIONS DE MONTAGE
INDICACIONES PARA EL MONTAJE



Distributor Fuel Injection Pump
Pompe Distributrice
Bomba de Inyeccion Distribuidora
EP/VA... 0460...

ROBERT BOSCH GMBH STUTTGART GERMANY

TABLE OF CONTENTS

1. Installation and adjustment of the injection pump

   1.1 By using a dial indicator
   (This method is generally used in experimental work)

   1.2 By using a mark on the flange of the pump housing

   1.3 By using an adjustment pointer and a mark on the face cam

2. Venting the injection system

SOMMAIRE

1. Montage et calage de la pompe d'injection

   1.1 Calage avec l'utilisation d'un comparateur (cette méthode est prépondérante aux ateliers d'étude)

   1.2 Calage avec l'utilisation d'un repère (trait gravé) sur le flasque du corps de pompe

   1.3 Calage avec l'utilisation d'un index de réglage et d'un repère sur la came

2. Purge d'air de l'installation d'injection

CONTENIDO

1. Montaje y ajuste de la bomba de inyección

   1.1 Montaje usando un micrómetro de esfera
   (Este método se usa principalmente en experiencias)

   1.2 Montaje basándose en una marca (trazo) en la brida del cárter de la bomba

   1.3 Montaje usando un índice de ajuste y una marca en el disco de levas

2. Purga del aire de la instalación de inyección

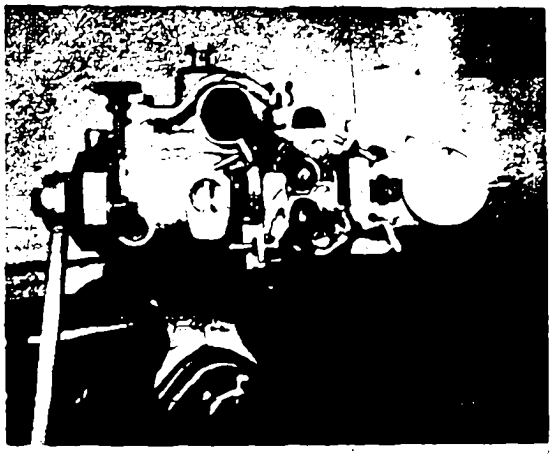


Fig. 1

1.1 "Dial-indicator method"

1.1.1 Preparing the injection pump (Fig. 1)

Remove the central screw plug (vent screw) from the distributor head. The distributor groove on the plunger is now visible and must be set in the direction of the "delivery" outlet.

Install the dial indicator holder 1 688 130 044 (EP 466) with gasket in place of the central screw plug. Fit dial indicator 1 687 233 011 (EFAW 7) and in BDC position of the face cam preload approx. 5 mm (0.197 in.) and set it to zero.

Rotate the drive shaft in the direction of rotation until the dial indicator shows the reading given on the relevant pump Test Sheet for (Position for beginning of delivery at plunger stroke ... mm)

Lock the drive shaft in position with lock screw 1 683 453 001 (EFSR 24 Y 3 Z). For this purpose, a bore is provided on the flange between the tubing connections.

1.1.2 Preparing the engine

Set the engine to the delivery timing mark provided by the manufacturer.

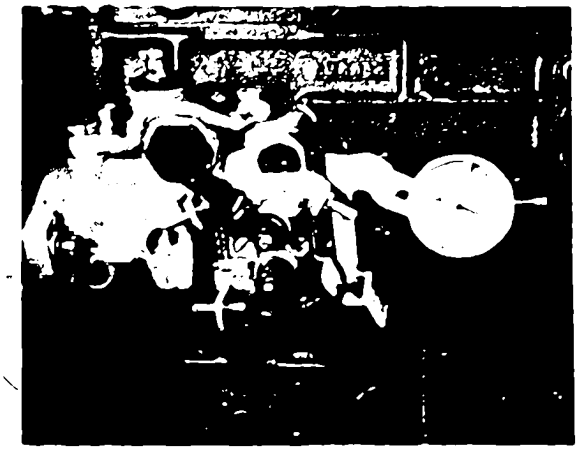


Fig. 2

1.1.3 Installation of the pump (Fig. 2)

Locate and fasten the pump. Pay attention that the pump is fixed centrally in its long flange slots. Remove the lock screw and re-install the plug.

Then correct

(Position for beginning of delivery at plunger stroke ... mm)

setting and secure the pump. Remove the dial indicator holder and re-install the plug.

N.B. If the pump has to be installed without using the lock screw, allowance must be made for a matching drift angle on the engine

(see 1.1.2).

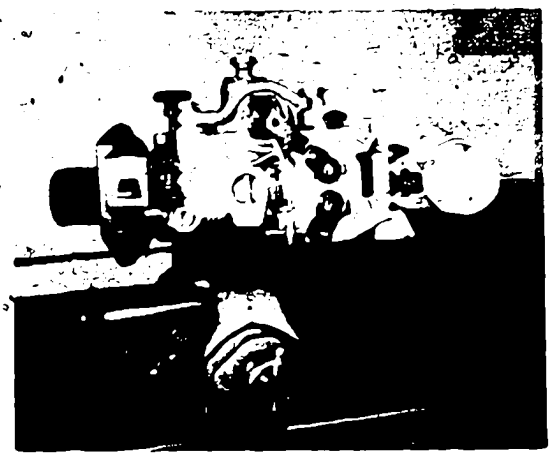


Fig. 3

Fig. 4

1.2 "Marking method"

1.2.1 Preparing the injection pump (Fig. 3)

Remove the central screw plug (vent screw) from the distributor head. The distributor groove on the plunger is now visible and must be set in the direction of the "delivery" outlet.

Install the dial indicator holder 1 688 130 044 (EFEP 466) with gasket in place of the central screw plug. Fit dial indicator 1 687 233 011 (EFAW 7) and in BDC position of the face cam preload approx. 5 mm (0.197 in.) and set it to zero.

Rotate the drive shaft in the direction of rotation until the dial indicator shows the reading given on the relevant pump Test Sheet for

(Marking for beginning of delivery at plunger stroke ... mm and ... angle on the marking device)

Lock the drive shaft in position with lock screw 1 683 453 001 (EFSR 24 Y 3 Z). For this purpose, a bore is provided on the flange between the tubing connections.

Set marking device EFEP 464 to the angle specified on the Test Sheet, fasten it on the drive shaft and mark the flange. Thereafter, remove the marking device, dial indicator holder and lock screw and re-install the plugs.

1.2.2 Preparing the engine

A "missing-tooth" pinion is used to couple the engine with the injection pump. In this case, the engine manufacturer has made a mark (Beginning of delivery) on the mounting flange for the injection pump.

1.2.3 Installation of the pump (Fig. 4)

Insert the injection pump and twist it until the marks coincide. Fasten the pump.

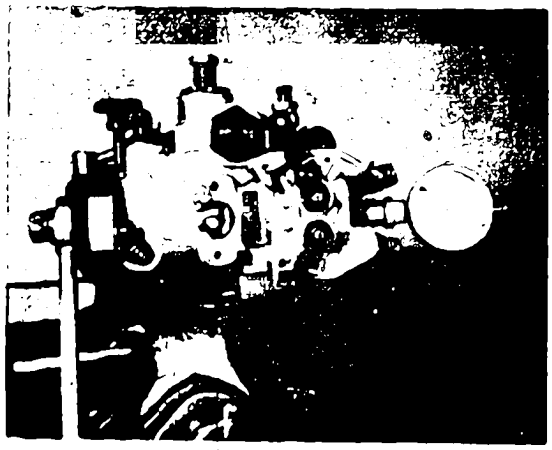


Fig. 5

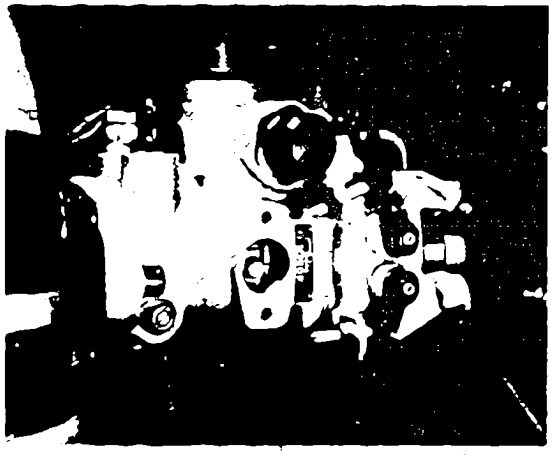


Fig. 6

1.3 "Pointer method"

1.3.1 Preparing the injection pump (Fig. 5)

Remove the central screw plug (vent screw) from the distributor head. The distributor groove on the plunger is now visible and must be set in the direction of the "delivery" outlet.

Install the dial indicator holder 1 688 130 044 (EFEP 466) with gasket in place of the central screw plug. Fit dial indicator 1 687 233 011 (EFAW 7) and in BDC position of the face cam preload approx. 5 mm (0.197 in.) and set it to zero.

Rotate the drive shaft in the direction of rotation until the dial indicator shows the reading given on the relevant pump Test Sheet for

(Pointer setting for beginning of delivery at plunger stroke ... mm)

Lock the drive shaft in position with lock screw 1 683 453 001 (EFSR 24 Y 3 Z). For this purpose, a bore is provided on the flange between the tubing connections.

Set the adjustment pointer on the roller ring to coincide with the mark on the face cam. Remove the dial indicator holder and re-install the plug.

N. B.: There may be 2 marks on the face cam, the one marked "L" being for a counter-clockwise rotating pump.

1.3.2 Preparing the engine

Set the engine to the timing mark (Beginning of delivery) provided by the manufacturer.

1.3.3 Installation of the pump (Fig. 6)

Insert the injection pump and fasten it. Pay attention that the pump is fixed centrally in the long flange slots. Remove the lock screw and re-install the plug.

1.3 "Méthode de l'index"

1.3.1 Préparation de la pompe d'injection (Fig. 5)

Démonter le bouchon central d'obturation (vis de purge) sur le corps distributeur. Amener la rainure distributrice du piston (qui est maintenant visible) dans le sens de la sortie qui "débite".

Monter le support de comparateur 1 688 130 044 (EFEP 466) avec son joint à la place du bouchon central d'obturation. Monter le comparateur 1 687 233 011 (EFAW 7), puis lorsque la came se trouve au point mort bas et pour une compression de 5 mm. le positionner sur "zéro".

Faire tourner l'axe d'entraînement dans son sens de rotation jusqu'à ce que l'aiguille atteigne la cote prescrite indiquée dans la feuille de valeurs d'essai correspondant à la pompe à contrôler.

(position du commencement de débit à l'index pour une course de piston de ... mm).

Maintenir fermement l'axe d'entraînement dans cette position à l'aide de la vis 1 683 453 001 (EPSR 24 Y 3 Z). Pour cela il est prévu sur le flasque entre les raccords, un trou correspondant.

Faire coincider l'index de réglage monté sur la bague de roulement avec le repère du disque à came. Retirer le support de comparateur et obturer le trou.

Remarque: il peut y avoir 2 repères sur le disque à came, dont l'un désigné par "L" est prévu pour une pompe rotation à gauche.

1.3.2 Préparation du moteur

Régler le moteur au repère commencement d'injection (FB) gravé par le constructeur.

1.3.3 Montage de la pompe (Fig. 6)

Introduire la pompe et la fixer. Veiller à ce que les boutonnières du flasque se trouvent en position moyenne. Démonter la vis de blocage et obturer le trou.

1.3 "Método del índice"

1.3.1 Operaciones previas en la bomba de inyección (Fig. 5)

Retirar el tornillo de cierre central (tornillo de purga del aire) del cuerpo del distribuidor. Colocar la ranura de distribución (ahora visible), del pistón, en dirección de la salida que "demande suministro".

Montar el soporte del micrómetro 1 688 130 044 (EFEP 466) con su junta en lugar del tornillo de cierre central. Colocar el micrómetro de esfera 1 687 233 011 (EFAW 7) y en el punto muerto inferior ponerlo a "cero", con una tensión previa de unos 5 mm.

Girar el eje de accionamiento en el sentido de funcionamiento, hasta que el micrómetro marque la medida indicada en la Hoja de ensayo para la bomba correspondiente.

(Indicación del índice de comienzo del suministro para una carrera del pistón de ... mm).

Sujetar el eje de accionamiento con el tornillo de bloqueo 1 683 453 001 (EFSR 24 Y 3 Z) en esta posición, para lo que existe el correspondiente orificio en la brida, entre los racores de conexión.

Hacer coincidir el índice de ajuste del anillo de rodillos con la marca del disco de levas. Retirar el soporte del micrómetro y cerrar el orificio.

Observación: Sobre el disco de levas pueden existir dos marcas, de las cuales la designada con "L" está prevista para bombas que giran a izquierdas.

1.3.2 Operaciones previas en el motor

Colocar en posición la marca señalada por el fabricante en el motor (FB).

1.3.3 Montaje de la bomba (Fig. 6)

Presentar la bomba y fijarla. En esta operación tener cuidado que los taladros rasgados de la brida queden centrados. Retirar el tornillo de bloqueo y cerrar el orificio.

Thereafter correct the adjustment (the adjustment pointer must coincide with the corresponding mark on the face cam) and secure the pump. Close the inspection hole.

N. B. If the pump has to be installed without using the lock screw, allowance must be made for a matching drift angle on the engine (see 1. 3. 2).

2. Venting the injection system

2. 1 After the pump is installed, fill it with filtered fuel.

2. 2 Vent the fine filter at the vent screw until bubble-free fuel leaks out.

2. 3 Vent the pump at the vent screw on the inlet to the distributor head until bubble-free fuel leaks out.

2. 4 Vent the pressure chamber in the distributor head at the vent screw (central screw plug) until bubble-free fuel leaks out.

N. B. After the installation steps, it may happen that the pump is set on a delivery stroke and there is no connection between the suction chamber and the pressure chamber; therefore no fuel can leak through the vent screw. In this case, the pump has to be rotated a little farther.

When tightening the vent screw (central screw plug), pay attention that the gasket fits perfectly on the distributor head and that the vent screw is tightened with a torque of 4. 5 - 5. 5 kgm (32. 5 - 39. 8 ft. lb.).

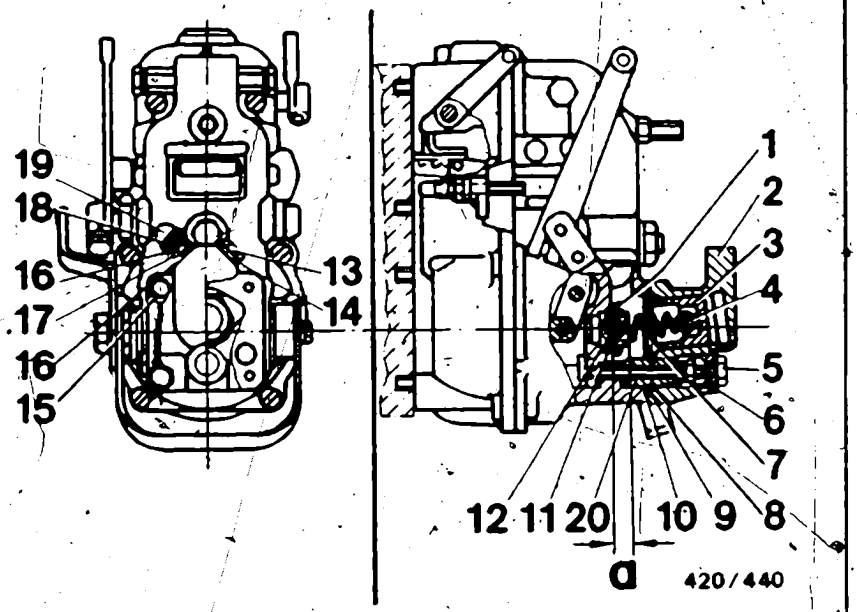
2. 5 Connect up the high-pressure lines according to the injection sequence. It is recommended that they are tightened only on the pump at first and that the engine is then cranked over to fill them. Thereafter connect up the high-pressure lines to the nozzle holders.

Register 40...46, 58

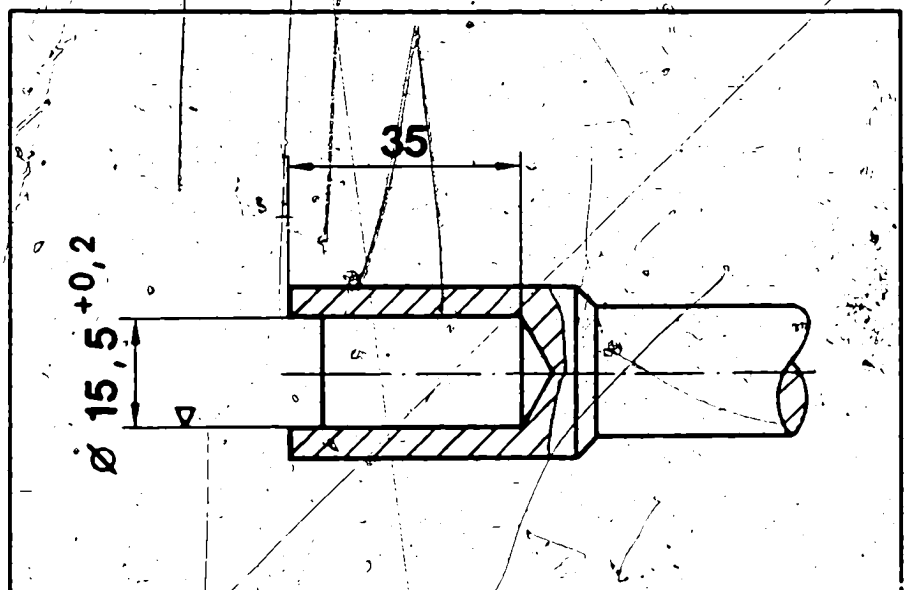
File Identity VDT-I-420/120 En

RSV GOVERNOR 11.1986

Instructions for assembly and testing the stabilizer



1 = Lock nut
2 = Stabilizer housing
3 = Stabilizer piston
4 = Bolt
5 = Screw plug
6 = Seal ring
7 = Stabilizer spring
8 = O-ring
9 = Gasket
10 = Partioning plate
11 = Threaded bushing
12 = Bolt
13 = Screw plug
14 = Seal ring
15 = Fastening screw
16 = Seal ring
17 = Lock nut
18 = Throttle screw
19 = Cap nut
20 = Guide bushing
a = Extension



420/441

Assembly
Requirement:
Complete fuel-injection pump assembly without built-on stabilizer is clamped on to the fuel-injection pump test bench and the sleeve position of the governor is set (microcard SIS-W-420/310, coordinate C4).

Put the threaded bushing (Item 11), bolt (Item 12), spring (Item 7) and lock nut (Item 1) together to form an assembly and screw into the threaded bore in the governor tensioning lever, in which the torque-control spring retainer usually sits. Make sure that the lugs of the stabilizer spring are precisely aligned along the longitudinal axis of the tensioning lever. The extension "a" of the screwed-in threaded bushing is 7.0...8.0 mm. For screwing in and tightening the whole assembly, use socket wrench KDEP 2966 with modification (see illustration) and tighten lock nut to 30...35 Nm.

J4

After testing the spring attachment for freedom of movement, apply a thin coating of lubricating oil to the stabilizer piston (Item 3) and lock into spring lugs with bolt (Item 4) (spring lug must latch into bolt groove). Check stabilizer piston for freedom of movement and level position.

Lie the partitioning plate (Item 10) and gasket (Item 9) onto the sealing surface of the governor cover.

Thinly apply oil-tallow mixture 5 963 340 110 to O-ring (Item 8) and pull onto guide bearing (Item 20).

Fit stabilizer housing (Item 2) and tighten onto governor housing with fastening screws (Item 15). Specified tightening torque = 6...8 Nm.

Testing

After removing the cap nut (Item 19), open the throttle screw (Item 18) by approx. 4...5 rotations. Remove screw plug (Item 13). Screw the tailpiece of the test hose KDEP 1618 into the threaded bore. The hose must be laid vertically.

Fill up the governor with lubricating oil until the oil level is visible at the transparent test hose KDEP 1618.

Set the control lever to maximum deflection and fix in this position.

Switch on the test bench and drive the fuel-injection pump assembly at the specified speed for setting the full-load delivery.

J5

Increase speed until the governor has completed regulation and reduce speed again down to initial speed. Repeat this procedure (increasing and decreasing the speed) four to five times.

On increasing the speed, the oil level in the test hose KDEP 1618 must rise each time and drop correspondingly on decreasing the speed.
If this is not the case, check whether the stabilizer piston (Item 3) has freedom of movement or whether the setting of the throttle screw (Item 18) is correct and, if necessary, put these right.

After successfully testing the operation of the stabilizer, shut down the test bench. Close the throttle screw as far as it will go and tighten the lock nut (Item 17). Position the seal ring (Item 16) and tighten the cap nut (Item 19).

Unscrew the test hose KDEP 1618 from the stabilizer housing and screw the screw plug with seal ring (Items 13 and 14) into the stabilizer housing and tighten.

Continue governor adjustment in accordance with the test instructions SIS-W-420/310.

Published by:

Robert Bosch GmbH
Division KH
After-Sales Service Department for
Training and Technology (KH/VSK)

Please direct questions and comments concerning the contents to our authorized representative in your country.

VE PUMP

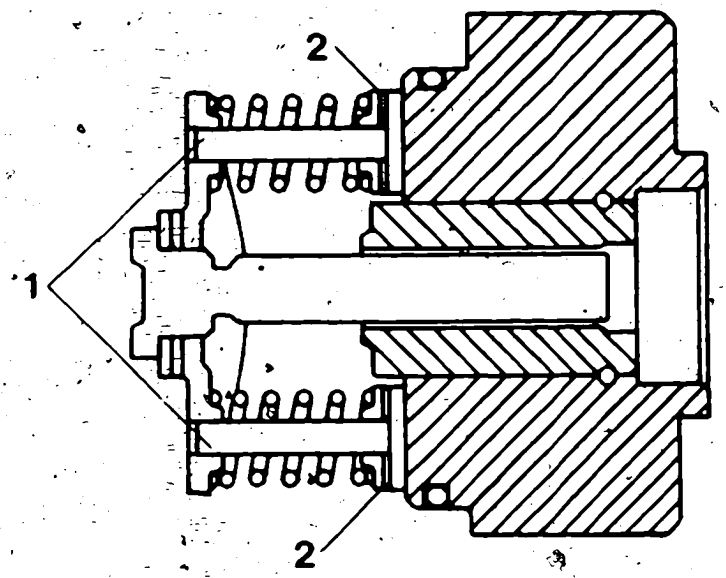
Assembling the distributor head

11.1986

In the case of distributor-type fuel-injection pumps installed in vehicles with direct-injection engines, the plunger return spring assembly is positioned in series production at the TDC of the distributor plunger with a specific force.

These pump versions are, therefore, recognizable in that the designation K_{OT} is used in the relevant test specification sheet instead of the K_F adjustment dimension.

J7



1 = Plunger return spring assembly
2 = Shim rings

The adjustment method with K_F dimension cannot be applied with these pump versions.

When repairing, make absolutely certain that the shim rings removed from beneath the spring seat when disassembling are reinstalled in the same quantity and with the same thickness.

Published by:

Robert Bosch GmbH
Division KH
After-Sales Service Department for
Training and Technology (KH/VSK)

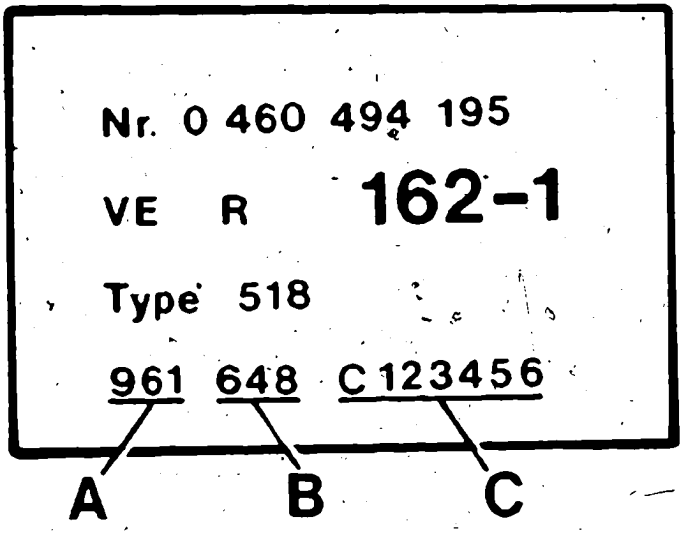
Please direct questions and comments concerning the contents to our authorized representative in your country.

Register 40..46, 58
File Identity VDT-I-460/147 En

DISTRIB.-TYPE FUEL-INJ. PUMP
R 162-1
for Peugeot 309 D and Citroen BX
with XUD 9 engine

12.1986

Insufficient load pick-up at idle



A = Works code no. B = Date of manufacture (FD)
C = Serial number

With this vehicle, it may come about in isolated cases that load pick-up is insufficient at idle. This expresses itself through an excessive drop in idle speed, e.g., when electrical consuming devices are switched on.
The engine "shakes" and the vibrations are clearly noticeable in the passenger compartment. The same effect can arise on sudden release of the accelerator.

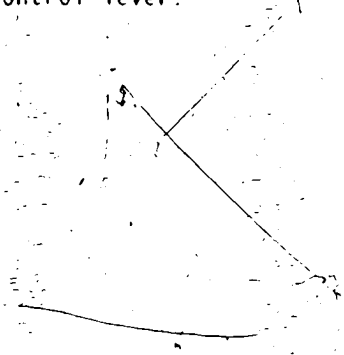
The cause of this is a defective idle spring in the distributor-type fuel-injection pump VE.. 4/9 F 2300 R 162-1 (0 460 494 195). However, this fault can arise only in fuel-injection pumps with the works code no. 961 and which are stamped with the dates of manufacture 647 (7.1986) up to 649 (9.1986) (see figure).

The service-parts list of the VE.. R 162-1 is being prepared.
However, the position of this idle spring may be taken also from the service-parts list for the VE.. R 162 (0 460 494 153).

The complaint can be eliminated by exchange of the idle spring 1 464 650 413, item 299 of the service-parts list. Please order the correct spring under the same part number in the usual way immediately.

To exchange the idle spring, the fuel-injection pump must be removed. After exchange, the pump must be tested on the pump test bench in accordance with the provisional test specifications contained in this Technical Bulletin. Once the final test specifications have been published, these test specifications will be invalid and will be replaced by the test specifications published in the WP microcards.

Fuel-injection pumps which have been repaired in an After-Sales Service workshop in the manner described above must be marked with a yellow dot (e.g. sealing wax) on the control lever.



Within the warranty period, we will refund you the following for this work:

* 25 WU for installation/removal
* 5 WU for repair
* 8 WU for testing the fuel-injection pump

Please deal with warranty cases in the usual way with reference to this Technical Bulletin. Enter the special fault number 18 in the warranty-claim form.

Fuel-injection pumps which have the above-stated works code no. and dates of manufacture, but also have a white dot on the control lever have already been equipped at the works with the correct idle spring and do not need attention. The complaint has other causes which must be determined.

Published by:

ROBERT BOSCH GMBH
Division KH
Technical After-Sales Service (KH/VKD2)

Please direct questions and comments concerning the contents to our authorized representative in your country.

J11

Test Specifications Distributor-type Fuel-injection Pumps

WPP 001/4 PEU 1,9 d
1. Edition
En

VE 4/9 F 2300 R 162-1
0 460 494 195
DHK: 1 688 901 022
Fuel injection test tubing 1 680 750 073 6x2x450 mm

Overflow temperature 45° C

supersedes
company Peugeot 309 D
engine XUD 9

All test specifications are valid only for Bosch Fuel-injection Pump Test Benches and Testers • Test Instructions and Test Equipment see VDT-W-460/

Pre-stroke setting mm

1. Settings

	Rot. speed rev/min	Settings		Charge-air press. bar (kgf/cm²)	Difference in delivery cm³
1.1 Timing device travel	1250	3,2-3,6	mm		
1.2 Supply pump pressure	1250	3,9-4,5	bar (kgf/cm²)		
1.3 Full-load delivery with charge air pressure	-		cm³/1000 strokes		
Full-load delivery without charge air pressure	1250	29,5-30,5	cm³/1000 strokes		2,5
1.4 Idle regulation	A 550	2,5-3,5	cm³/1000 strokes		2,0 B
1.5 Full-speed regulation	2400	20,0-26,0	cm³/1000 strokes		
1.6 Start	100	min. 44,0	cm³/1000 strokes		
1.7 Load dependent port closing	1250	-			

2. Test Specifications checking values in brackets ( )

2.1 Timing device	n = rev/min	700	1250	2000
	mm	0,2-1,0(0-1,3)	(2,7-4,1)	7,5-8,3(7,2-8,6)
2.2 Supply pump	n = rev/min	700		2000
	bar (kgf/cm²)	2,3-2,9		5,9-6,5
Overflow delivery	n = rev/min	700		2300
	cm³/10 s	41-83(26-98)		55-138(40-153)

2.3 Fuel deliveries

Speed control lever	Rot. speed rev/min	Fuel delivery cm³/1000 strokes	Charge air press. bar (kgf/cm²)
End stop	2650	max. 7,0	
	2500	11,5-17,5 (10,5-18,5)	
	2400	(19,0-27,0)	
	2250	31,0-33,0 (29,8-34,2)	
	2000	31,5-33,5 (30,3-34,7)	
	1250	(27,8-32,2)	
	700	29,5-32,5 (28,0-34,0)	
switch-off			
Idle stop	375 B	8,5-10,5 (5,5-13,5)	
	470 C	8,0-10,0 (5,0-13,0)	
	550 A	(max. 7,0)	
End stop	200	min. 40,0	
	300	max. 35,0	

2.4 Solenoid cut-in voltage min. 10,0 Volt
rated voltage 12 V

3. Dimensions

Designation	for assembly and adjustment mm
K	3,2-3,4
KF	5,7-6,0
MS	1,4-1,55
SVS	3,0
A XK'	17,0-19,0
B XL	11,5-14,9

Observations
*) Residual delivery setting idle setting (LFG) as per VDT-1-460/135

VE-PUMP 4/9 F 2400 R 221 AND ..R 224 (0 460 494 179 and ..185) in VW Golf/Jetta Diesel
Complaints about bucking when driving

Register 40...46, 58
File identity VDT-I-460/148 En
4.1987

In an isolated number of cases, complaints have arisen with regard to the bucking of these vehicles when on the road. Bucking is not a fault for which BOSCH is liable and therefore cannot be considered for warranty claims.

However, a remedy may under certain circumstances be found for VE pumps of FD 646 and older by installing a different part-load governor, Item 68.

Part-load governor	Previous governor	New governor
VE ...R 221	1 463 161 751	1 463 161 780
VE ...R 224	1 463 161 677	1 463 161 782

The new part-load governors have been installed as standard as of July 1986 (FD 647). Theses service-parts lists will be changed accordingly. The test specifications do not change. Exchange of the part-load governor must be charged to the customer even within the warranty period.

Published by:

ROBERT BOSCH GMBH
Division KH
Technical After-Sales Service (KH/VKD 2)

Please direct questions and comments concerning the contents to our authorized representative in your country.

P PUMPS WITH RQV GOVERNOR FOR SAAB SCANIA ENGINES DS (C)11 AND DS (C) 14
GOVERNOR CONVERSION TO V-NUMBER VERSION IN VEHICLES WITH EDDY-CURRENT BRAKE

Register 40...46, 58
File Identity VDT-I-400/124 En
03.1987

When driving vehicles with an eddy-current brake in the drive train, unstable conditions may arise.

These unstable conditions occur in the part-load range at approx. 1400...1600 min^{-1} (engine speed) and become noticeable through bucking and jolting of the vehicle.

This fault can be eliminated through the sensitivity of the fuel-injection pump governor being reduced by carrying out a conversion.

This conversion must be carried out also in the case of subsequent installation of an eddy-current brake, in order to avoid the fault described above.

Contrary to other information, for reasons of safety, conversion of the governor is not permitted on the vehicle.

Two standard V numbers have been specified for this conversion for the engine variants DS (C) 11 and DS (C) 14:

I.
RQV 200 .. 950 / 1000 / 1050 PAV 17678
for crane operation and auxiliary drive

II.
RQV 200 .. 950 / 1000 / 1050 PAV 18021
for applications without auxiliary drive.
Improved driveability compared to Variant I.

Necessary components for conversion

	RQV...PAV 17678	RQV...PAV 18021
Idle spring, top	1 424 618 044	2 424 618 064
Governor spring, center	1 424 634 039	1 424 634 027
Governor spring, inner	1 424 619 025	1 424 619 025
Spring seat, bottom	2 420 220 018	2 420 220 006
Spring seat, bottom	2 420 326 014	2 420 326 014
High-press. disk	1x2 420 101 027	2x2 420 101 027

The values for sleeve-travel adjustment when testing the governor may be taken from the graphs. The remaining permissible speeds and injected fuel quantities must be set in accordance with the basic combination (see test-specifications microcard).

In the case of pumps with a service life of > 20,000 km, the rubber buffer in the flyweight must also be exchanged (pay attention to governor play).

The governor must be marked after the conversion with the relevant V number.

The conversion must be charged to the customer.

Sleeve-travel curve of RQV ... PAV 17 678

Speed (min^{-1})	Sleeve travel (mm)
100	0.6...0.8
400	3.7...3.9
660...950	6.4...6.6
1050	7.8

Sleeve-travel curve of RQV ...PAV 18 021

Speed (min^{-1})	Sleeve travel (mm)
100	0.8...1.0
350	3.7...3.9
610...920	5.4...5.6
1050	6.8

Published by:

ROBERT BOSCH GMBH
Division KH
Technical After-Sales Service (KH/VKD 2)

Please direct questions and comments concerning the contents to our authorized representative in your country.

INJECTION-PUMP ASSEMBLIES
0 402 678 800/...801
IN SCANIA ENGINES
DS 1440, 1442, 1142 Case,
DSI 1440, DSI 1441
CHANGE TO CAMSHAFT
AND FLYWHEEL ASSEMBLY

Register 40...46, 58
File Identity VDT-I-400/125 En
01.1987

In an isolated number of cases, fractures have occurred in camshafts in the injection-pump assemblies

PE 8 P 120 A 920/4 LS 7002
and ...7002-1 with
EP/RSV 350 ... 1100 P1/484
and ... 1050 P1/504.

Through design improvements of the camshaft (discontinuing Woodruff-key groove) and the use of a flywheel assembly with vibration dampers, this fault is eliminated.

As of the date of manufacture December 1986 (FD 652) the previous camshaft 2 416 158 065 has been replaced by 2 416 158 111 and the previous flywheel assembly 1 428 194 019 (without vibration dampers) replaced by 2 428 194 012 (with vibration dampers).

When working on the above-mentioned injection-pump assemblies, only the new camshaft and the new flywheel assembly must be used as service parts.

J17

When converting the assemblies, the following components are also changed:

Item 1/ 1	Governor housing	from 2 425 151 001	to 2 425 151 079
Item 58/ 1	Woodruff key	1 900 023 007	removed
Item 62/ 1	Retainer	2 916 600 006	is fitted
Item 66/ 1	Needle bearing	1 420 920 008	is fitted
Item 68/ 1	Sliding sleeve	from 1 420 322 026	to 1 420 505 055
Item 71/ 1	Supporting plate	1 420 101 078	is fitted
Item 71/01	Supporting plate	9 420 270 013	is fitted
Item 71/02	Supporting plate	9 420 270 014	is fitted
Item 71/03	Supporting plate	9 420 270 015	is fitted
Item 71/04	Supporting plate	9 420 270 016	is fitted
Item 32/ 1	Fork lever	from 1 421 933 048	to 9 420 270 011

The previous versions of the camshaft and of the flywheel assembly without vibration dampers are still to be used for other applications.

For assemblies including FD 651, the usual warranty periods are extended by a further 12 months and the max. number of service hours is increased for goodwill purposes from 2400 h to 3000 h. This goodwill arrangement is applicable only to the camshaft.

Please check your stocks and, if necessary, order the new parts in the usual manner.

Published by: ROBERT BOSCH GMBH
Division KH
Technical After-Sales Service (KH/VKD 2)
Please direct questions and comments concerning the contents to our authorized representative in your country.

Register 40...46, 58

IN-LINE PUMPS
SIZE P
0 402 046 756 AND .. 758 FOR
RVI VEHICLES R 340 and
R1 357

File Identity VDT-I-400/126 En

01.1987

Improved overflow-valve screw connection in EP housing

In the case of these injection pumps, as of FD 651 (November 1986) the screw connection of the overflow valve 2 417 413 028 (RVI part number 2 41028) has been improved in the series.

A number of injection pumps before FD 651 had already been converted to this improved screw connection and are marked with the letter H above the pump nameplate. All injection pumps as of FD 651 have been converted.

If injection pumps of FD 650 and older, which are not marked with the letter H, come in for after-sales service, proceed as follows:

Remove overflow valve.

Check whether the tapped hole of the screw-thread spigot is still present.

If the driver spigot is present:
pull out the screw-thread insert. To do this, grasp screw-thread driver spigot with flat-nose pliers, turn thread end clockwise towards center of hole and pull out complete screw-thread insert.

Before installing the new screw-thread insert, wash out the pump and thus clean the thread by actuating the hand pump. Catch any fuel which escapes in a suitable container.

Important: Use only new screw-thread insert without groove!

Mount new screw-thread insert so that the clearance between the screw-thread driver spigot and the housing sealing surface (measured with a depth gauge) is 11.5 ± 0.3 mm.

Actuate hand pump again and thus wash out pump again. Catch any fuel which escapes in a suitable container.

Check whether there is sufficient clearance between the end face of the screwed-in overflow valve and the screw-thread driver spigot. To do this, screw in the overflow valve without gasket by hand, till resistance is felt. Gap between overflow valve and housing sealing surface must be less than 0.6 mm (feeler gauge).

If the screw-thread driver spigot breaks during disassembly:

If the spigot of the screw-thread insert driver spigot breaks off and the threads of the screw-thread are positioned cleanly in the hole, the screw-thread insert does not need to be exchanged. However, make sure that the broken-off spigot is removed.

If the spigot of the driver spigot breaks off while being pulled out and the threads of the screw-thread are not positioned cleanly, grasp the screw-thread driver

spigot with flat-nose pliers, turn the thread end clockwise towards the center of the hole and pull out the complete screw-thread insert.

Afterwards, clean the suction gallery and the tapped hole by actuating the hand pump.

If, when testing the screw-thread insert, it is found that the driver spigot has already been broken off, exchange the pump and overflow valve as complete assemblies.

Mount overflow valve:
Mount overflow valve with new gasket (1.5 mm thick) and tighten to 40 Nm.
Afterwards, mark the injection pump with the letter H at the lug above the pump nameplate, using a stamping punch.

Execution:

The work described above is for the most part carried out by RVI Service itself under the request of Customer RVI.

Execution in France:
When the pumps are exchanged by RVI After-Sales Service, they are provided by RVI. If in exceptional cases the work is carried out by Bosch Service departments, the pumps are ordered in the usual manner.

Execution elsewhere abroad, including West Germany:

When the pumps are exchanged, RVI Service will request supply of the pumps via Bosch After-Sales Service. These pumps must be ordered in the usual manner.

J21

West Germany:
BG/BD sends the exchange pumps with warranty claim to
Robert Bosch GmbH
KS / Q S G
Am Boschwerk
D-7000 Stuttgart 30

Elsewhere abroad (excluding France):
Pumps are returned with warranty claim via RG/AV to KS/QSG.

Time to be paid:
For exchange of the screw-thread, 1 h. (10 WU) is calculated; for exchange of the pump, 5.4 h. (54 WU).

Published by:

ROBERT BOSCH GMBH
Division KH
Technical After-Sales Service (KH/VKD 2)

Please direct questions and comments concerning the contents to our authorized representative in your country.

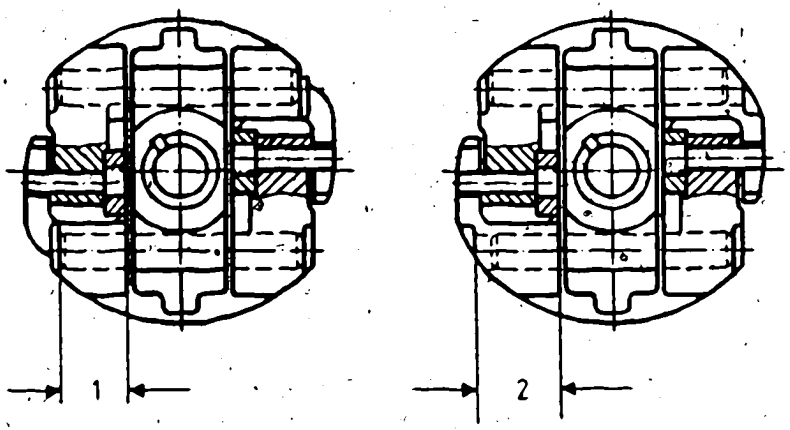
J22

Register 40...46, 58

File Identity VDT-I-400/127 En

NEW RSV FLYWEIGHT ASSEMBLIES FOR INJECTION PUMPS OF SIZE P ... S 7000

01.1987



1 = Old version 1 428 194 000
1 428 194 001
Bearing length both sides 18 mm

2 = New version 1 428 194 019
1 428 194 020
Bearing length 22 mm, on one side pin is in withdrawn position at strengthened captive-arm side.

On injection pumps of size P ... S 7000 with RSV governors, only flyweight assemblies with strengthened captive arm (see Fig.) may be installed.

If the old version is ordered, the strengthened version will be supplied.

Likewise, remaining stocks of the old version for the above-mentioned size must not be used up.

Published by:

ROBERT BOSCH GMBH
Division KH
Technical After-Sales Service (KH/VKD 2)

Please direct questions and comments concerning the contents to our authorized representative in your country.

NEW COUPLING PARTS

AND NEW ACCESSORIES FOR

EP TEST BENCHES

4.1987

* NEW COUPLING PARTS FOR EP TEST BENCHES

Modern injection-pump technology demands the correct techniques for testing injection pumps. Test results have proven that when there is little mass between the plates of the backlash-free clutch and the camshaft of the injection pump, the fuel-delivery dispersion at the outlets of the pump remains small. In this way, it is easier to comply with the test specification.

We have made use of these findings and developed new coupling parts which are suitable for modern fuel-injection-pump testing (as at the manufacturer's works).

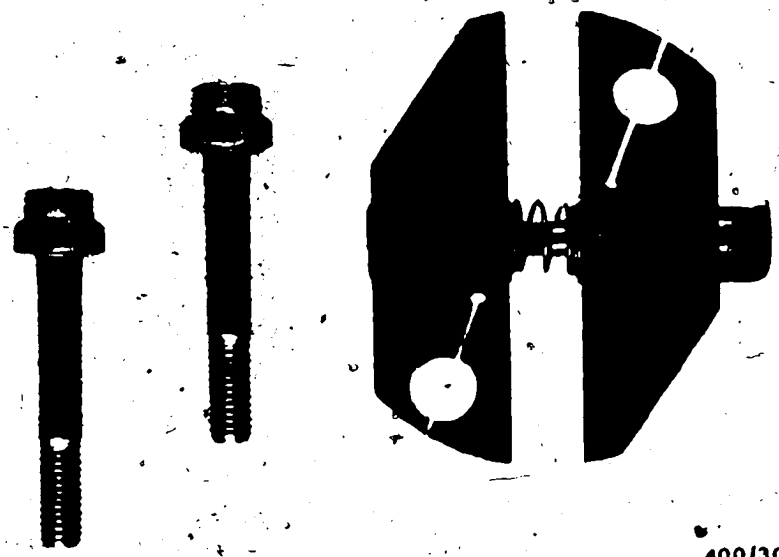
* Backlash-free driving couplings

For each type of contemporary EP test bench (approved for the After-Sales Service), a suitable, backlash-free driving coupling in accordance with ISO 4008/1 has been newly defined. The driving couplings which have been used until now are no longer in the sales program and must no longer be used for testing to ISO.

The newly defined driving couplings are necessary for safety reasons.

EP test bench	No longer approved for reasons of safety: Driving coupling used to date	Driving coupling to ISO 4008/1	Newly def. driving couplings to ISO 4008/1
EFEP 41..	1 686 401 003	1 686 401 023 (1)	1 686 401 028 (1) (2) 1 686 401 029 (1) (2)
EFEP 375.., 410..	1 686 401 004	1 686 401 018	1 686 401 031 (2)
EFEP 5 C, 25 E	1 686 401 005, 007	1 686 401 018 (3)	1 686 401 031 (2) (3)
EFEP 25 F..	1 686 401 005 007	1 686 401 018 (4)	1 686 401 031 (2) (4)
EFEP 385.., 390..,	1 686 401 006 012	1 686 401 023 (5)	1 686 401 028 (2) (5) 1 686 401 029 (2) (5)
EFEP 500.., 500A.., EPS 270..	1 686 401 009	1 686 401 017 (6)	1 686 401 031 (2) (6)
EFEP 515.., 615..,	1 686 401 010	1 686 401 022 (7)	1 686 401 028 (2) (7) 1 686 401 029 (2) (7)
EFEP 615 A..	1 686 401 011	1 686 401 023 (7)	1 686 401 028 (2) (7) 1 686 401 029 (2) (7)
EPS 604.., 704..,	--------	1 686 401 015 (6)	1 686 401 030 (7)
EPS 707.., 711..,	--------	1 686 401 020 (7)	1 686 401 026 (7) 1 686 401 027 (7)

(1) Flange bushing present on drive shaft must still be used.
(2) Reducing ring for pilot diameter 40 mm included in scope of delivery.
(3) Use flange of old coupling.
(4) Make reducing ring for pilot dia. 37 mm yourself.
(5) Relevant new protective cover, part no. on request.
(6) Relevant new protective cover, Part No. 1 685 510 145
(7) Relevant new protective cover, Part No. 1 685 510 148

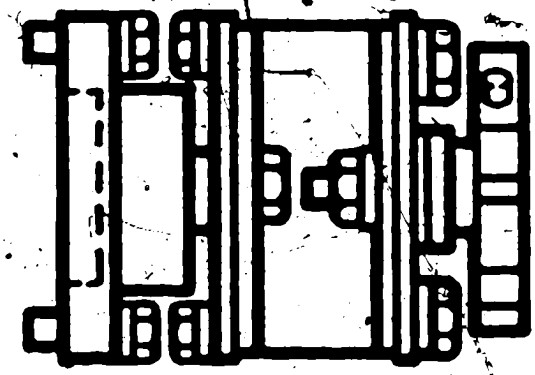


400/30

* Modification set

Part No. 1 687 001 157, 1 687 001 158

The ISO driving couplings 1 686 401 015, ..017, ..018 can be modified using the modification set 1 687 001 157 to give the models 1 687 401 030, ..031; the ISO driving couplings 1 686 401 020, ..022, ..023 can be modified using the modification set 1 687 001 158 to give the models 1 686 401 026, ..027, ..028, ..029.
In addition, make sure you always use the locating piece (adjusting device) 1 683 203 082 (2 pieces necessary) (see modification instructions).



400/31

* Driving coupling, backlash-free

Part No. 1 686 401 026
1 686 401 027
1 686 401 028
1 686 401 029
1 686 401 030
1 686 401 031

The driving couplings newly defined for reasons of safety are rated for a coupling loading capacity (peak driving torque of pump) as given in the following table.

J28

Rotational direction of pump driver and loading capacity	Clockwise up to 600 Nm Counterclockwise up to 350 Nm	Counterclockwise 600 Nm Clockwise up to 350 Nm	Clockwise and counterclockwise up to 150 Nm
Part No. of driving coupling	1 686 401 026 (1) 1 686 401 028 (1)	1 686 401 027 (1) 1 686 401 029 (1)	1 686 401 030 (2) 1 686 401 031 (2)

(1) Suitable for all fuel-injection pumps up to and including Sizes P and ZW.

(2) Suitable for all distributor-type fuel-injection pumps and in-line pumps of sizes M, MW, A.

---

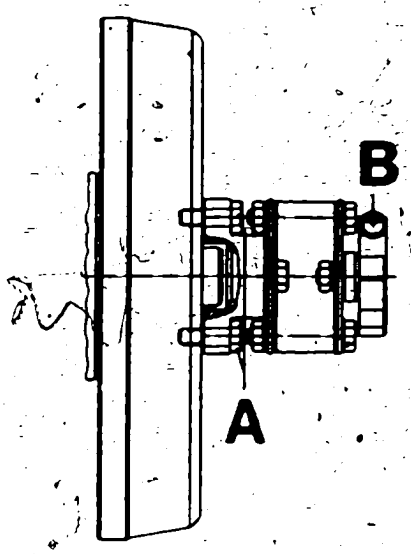
* A T T E N T I O N !

DANGER OF ACCIDENT WITH COUPLINGS AT FUEL-INJECTION PUMP TEST BENCHES

The ISO driving coupling is a safety component of the test bench. Repair of the ISO coupling may be carried out only by the After-Sales Service workshop of the BOSCH Service competent for your business, this After-Sales Service workshop having the necessary special tools to carry out this work.

Workshop safety guideline:
When clamping coupling halves of injection pumps between the clamping jaws of backlash-free driving couplings, make sure that the clamping screw of the clamping jaws is tightened using a torque wrench. The tightening torques depend upon the size of the clamping screws. This applies to all driving couplings.

K1



400/32

* Tightening torques of screw (A):

- M 8 = 25 Nm, M10 = 55 Nm, M12 = 95 Nm
  Tolerance ± 2 Nm

* Tightening torques of clamping screw (B):

Size	Installed in the driving couplings	Tightening torque Nm
M 8 x 65 DIN 912-12.9 Part No. 2 910 406 259	1 686 401 015 1 686 401 017 1 686 401 018 1 686 401 030 1 686 401 031	15 +2
M 10 x 80 DIN 912-12.9 Part No. 2 910 406 309	1 686 401 020 1 686 401 022 1 686 401 023	30 +2
M 12 x 80 DIN 912-12.9 Part No. 2 910 406 358	1 686 401 026 1 686 401 027 1 686 401 028 1 686 401 029	60 +5

K2

These tightening torques must always be complied with to avoid the risk of accident, injury to persons and damage to the machine. Likewise, the strength class 12.9 of the clamping screws must be observed.

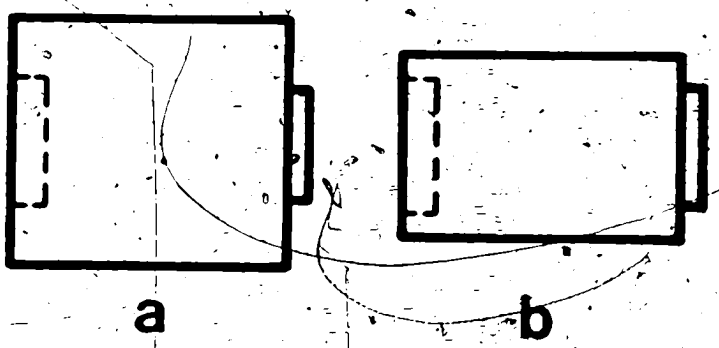
Consequences of work incorrectly performed:

* Clamping screws which are not tightened sufficiently may work loose in operation.

* Clamping screws which are tightened too much are over-turned and thus pre-damaged. They may break.

In both cases, there is a danger that the clamping jaws of the driving coupling may become loose during operation. This may result in wedging of the clamping jaws or the clamping screw inside the protective cover, this leading to the protective cover bursting and component parts being thrown out.

RISK OF ACCIDENT AND INJURY!



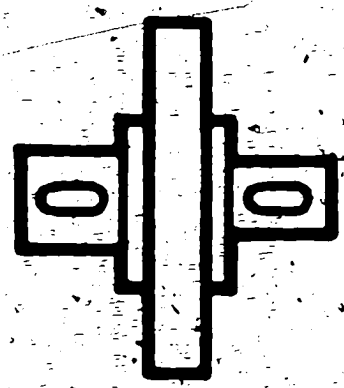
400/33

* Intermediate flanges

a = Intermediate flange for coupling diameter for 120 mm,
Part No. 1 685 700 140

b = Intermediate flange for coupling diameter 94 mm,
Part No. 1 685 700 143

In many cases, it was necessary to leave a greater clearance between the fuel-injection-pump housing and inertia flywheel of the test bench so that the control-rod-travel measuring device and the dial indicator could be assembled together. This led to the so-called "overlong version" of coupling halves. New insights mean that the application of this version has been forbidden (see introductory section).
The intermediate flanges are mounted between the inertia flywheel and backlash-free driving coupling and the pump is adapted with normal (short) coupling halves.



400/34

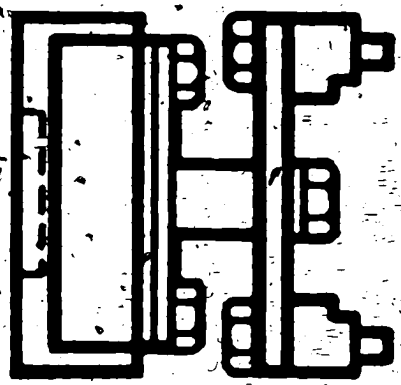
* Driving flange

Part No. 1 686 490 042

P pumps (Volvo, Scania, DAF) with built-on multi-plate motor clutch (with start-of-delivery marking) are driven by a driving flange. For fuel-delivery and governor setting at the test bench, the multi-plate motor clutch used to date had to be disassembled and replaced by a coupling half. The start-of-delivery marking could be made only after re-assembly. This conversion no longer applies thanks to the new driving flange. This driving flange has connection pins with a diameter of 25 and 30 mm.

Use only together with the intermediate flange 1 685 700 T40.

K5



400/35

* Driving coupling

Part No. 1 686 401 024

P pumps with driving flange (with start-of-delivery marking) were driven when testing via the KH driving device KDEP 1557 or earlier KDEP 1033. For some time, the driving flange of this pump has had an additional 2 tapped holes. These 2 tapped holes are provided especially for bolting on the driving coupling. In this case, the backlash-free driving coupling of the test bench is replaced by the driving coupling 1 686 401 024 which is connected to the driving flange of the pump by 2 bolts. In the case of pumps without these additional tapped holes in the driving flange, the KH driving device KDEP 1557 may continue to be used.

K6

P pumps of series ..S 7100 and ..S 7800 must continue to be driven by KDEP 1557.

The coupling half KDEP 1033 must not longer be used as of immediately.

Reason:

- This coupling half damages the driving couplings.
- Fuel-quantity dispersion due to mass on the camshaft of the pump being too great.

* Coupling halves

So-called "overlong" coupling halves were necessary in order to create sufficient space for the control-rod-travel dial indicator between the inertia flywheel and the injection pump. This space is now created by using the new intermediate flanges 1 685 700 140 and ..143. The reasons stated in the introductory section mean that the use of these "overlong" coupling halves is now forbidden.

The new coupling halves have been designed in accordance with the insights of modern fuel-injection-pump testing.

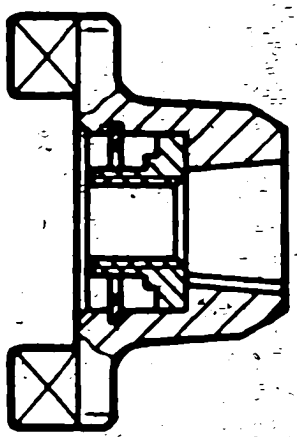
Special feature of all new coupling halves:

Retaining nut cannot be lost and at the same time it serves for pulling off the cone of the camshaft. This means that one particular operation is no longer applicable: "Screw in puller, pull off coupling".

Cone dia.	Coupling half used up to date		New coupling half	Driving coupling diameter	Jaw width
	Normal	Overlong			
17	1416430011	1416430012	1686430022	94	12
20	1416430010	1416430017	1686430024	94	12
25	1416430022	1686430007	1686430026	94	12
			1686430030	120	16
30	1416430032	1686430012	1686430032 (*)	120	16
			1686430034		

(*) Use if short screw thread at cone (16 mm long)

K8

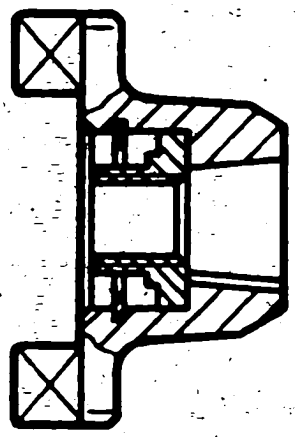


400/36

* Coupling half

Part No. 1 686 430 022
1 686 430 024
1 686 430 026
1 686 430 030
1 686 430 032
1 686 430 034

The coupling half for 30 mm cone
1 686 430 034 (and predecessor
1 686 430 012) has 2 keyways of 5 and 6 mm.



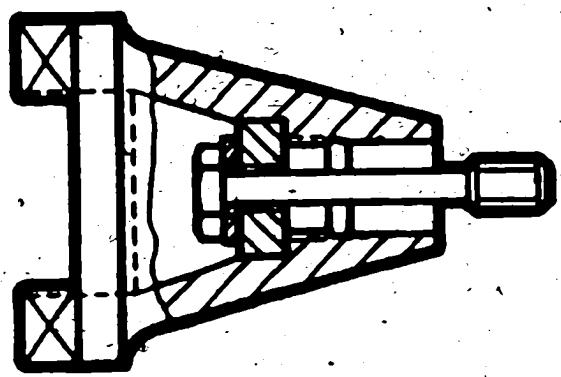
400/37

* Coupling half

Part No. 1 686 430 017

For the P pumps of the series ..S 7100 / ..S 7800 with cone diameter of 35 mm short, a new coupling half had to be created.
Special feature:
Retaining nut is at the same time used for pulling off the cone and cannot be lost.

K10



400/38

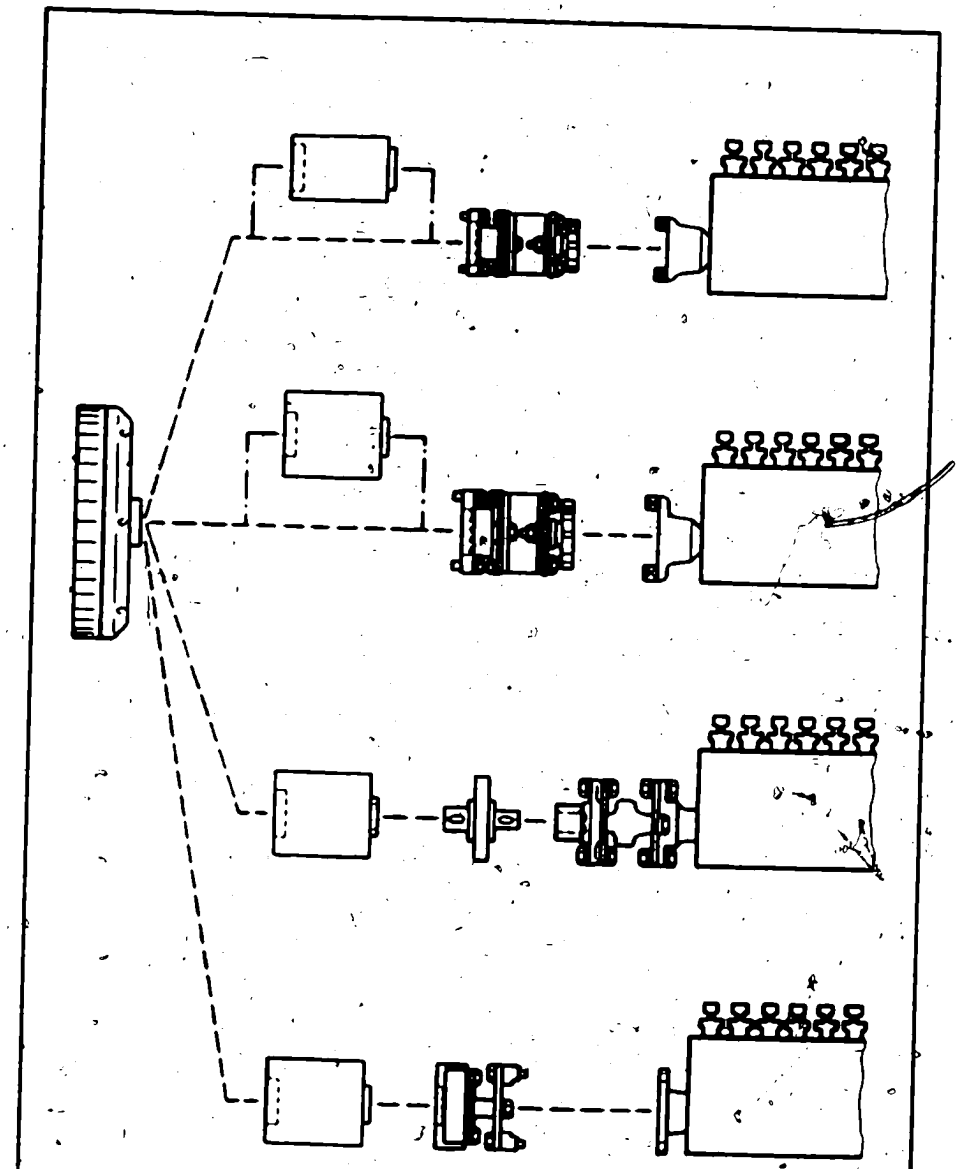
* Coupling half

Part No. 1 686 432 019

For the PES..M.. pump with RSF-II governor (DB engine series OM 601, 602, 603), a coupling half with groove toothing 1 x 58 to DB Standard N 442 is required.
Special features:
- Lefthanded-thread screw which cannot be lost
- Specified tightening torque 50 + 10 Nm.

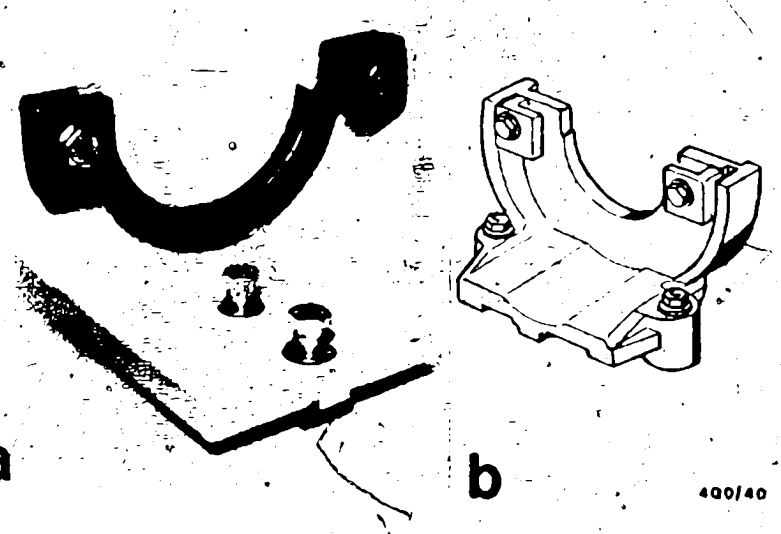
* System overview

The manner and combination in which the testing of fuel-injection pumps must be performed is shown below.



400/39

K12



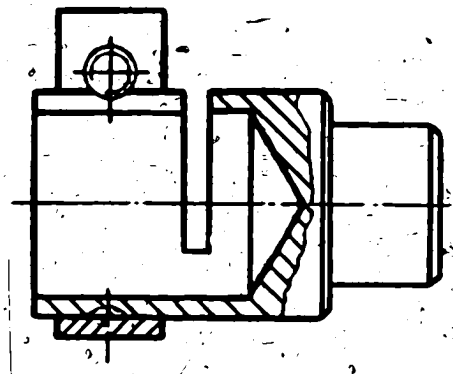
* NEW ACCESSORIES FOR EP TEST BENCHES

a = Universal clamping bracket with central clamping
for test benches EFEP 375../385../ 390.../410../500../
515/../615.. Part No. 1 688 010 124

The universal clamping bracket 1 688 010 010
(and ..011) used until now does not comply with
ISO 4008/1.

b = Universal clamping bracket with exterior clamping
for test benches EPS 604../704../707../711..
Part No. 1 688 010 129

K13



400/41

* Support clamp

Part No. 1 688 040 221

Old fuel-injection pumps M/RSF (control-rod-travel guide bushing with thread) have been supplied for some time in a new version, namely M/RSF II (control-rod-travel guide bushing without thread).
To enable the continued use of the control-rod-travel measuring devices 1 688 138.042 and 1 688 130 130, we have come up with an appropriate support clamp.
This support clamp is included in the scope of delivery of the above-mentioned control-rod-travel measuring device as of now.

K14

* Clamping flange

For fuel-injection pumps PES..P.. of the series S 3000, 3800, 7100 and 7800, a clamping flange with a diameter of 107 mm is required. Part No. 1 685 720 159

In the Federal Republic of Germany, orders must be sent to the technical equipment suppliers BG; throughout the rest of the world, to the respective RG/AVs.

Published by:

Robert Bosch GmbH
Division KH
After-Sales Service Department for
Training and Technology (KH/VSK)

Please direct questions and comments concerning the contents to our authorised representative in your country.

K15